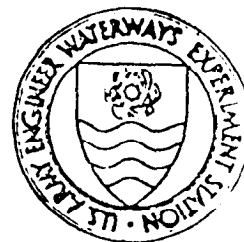


DREDGED MATERIAL RESEARCH PROGRAM



TECHNICAL REPORT D-78-25

HABITAT DEVELOPMENT FIELD INVESTIGATIONS
NOTT ISLAND UPLAND HABITAT DEVELOPMENT SITE
CONNECTICUT RIVER, CONNECTICUT

APPENDIX B: SURVEY OF TERRESTRIAL ECOLOGY
AND PRELIMINARY BOTANICAL MONITORING

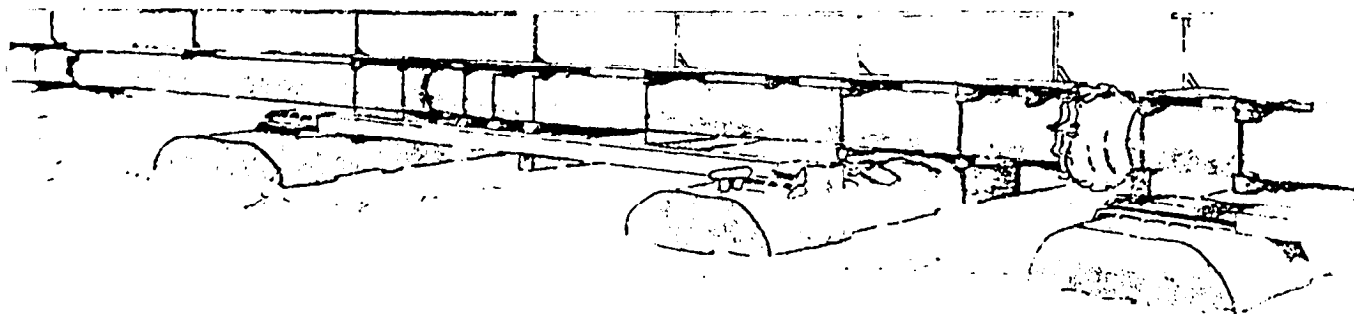
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July 1978

Final Report

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HABITAT DEVELOPMENT FIELD INVESTIGATIONS,
NOTT ISLAND UPLAND HABITAT DEVELOPMENT SITE,
CONNECTICUT RIVER, CONNECTICUT

- APPENDIX A: PRELIMINARY TERRESTRIAL ECOLOGICAL SURVEY
- APPENDIX B: SURVEY OF TERRESTRIAL ECOLOGY AND PRELIMINARY
BOTANICAL MONITORING
- APPENDIX C: POSTPROPAGATION MONITORING OF VEGETATION AND
WILDLIFE

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20. ABSTRACT (Continued).

Fourteen major vegetation associations in shrublands, grasslands, estuarine wetlands, and disturbed areas were delineated. A total of 253 species of plants were identified. Three species of small mammals and 70 species of birds were observed. This appendix also includes preliminary observations on experimental plantings of grasses and legumes at different levels of lime application.

SUMMARY

Research at the Nott Island upland habitat development site involved efforts in data collection and monitoring at the various operational phases. This report discusses efforts to describe biota on the island after disposal and prior to reclamation. It also presents initial observations on the establishment of experimental plots planted within the disposal area.

The biotic description includes vegetation, floristics, small mammals, and breeding birds. Note was made of occurrence of larger mammals and bird visitors. To develop the vegetation description, a detailed map was prepared using aerial photography and information obtained from field sampling. A total of 974 quadrats, 5 m in diameter were established, a complete species list and cover estimates for each species were taken in all quadrats. From this data, fourteen major vegetation associations were identified. These associations include four of shrubland, four of grassland, and five of estuarine marsh. The fourteenth category, disturbed vegetation, was for areas subjected to equipment traffic during the dredging and disposal operations. A total of 253 species of plants was identified on the island.

The dominant mammals in the upland areas of Nott Island, as determined by live trapping on a 15-m grid, were the meadow vole (*Microtus pennsylvanicus*), the meadow jumping mouse (*Zapus hudsonius*), and the short-tailed shrew (*Blarina brevicauda*). Statistically, neither the meadow vole nor the meadow jumping mouse showed a preference for shrubland, grassland, or wetland habitat. Other mammals occurring on Nott Island included white-tailed deer (*Odocoileus virginianus*), eastern mole (*Scalopus aquaticus*), muskrat (*Ondatra zibethicus*), and Norway rat (*Rattus norvegicus*).

Fifty-one species of birds were observed in 1976, 60 in 1975, and 70 over both years. In 1976, the breeding bird population was estimated to be 121 pairs comprising 16 species for a total density of 4.25 per ha. This represents a slight decline from 1975 when 145 pairs of 23 species were counted for a density of 5.09 per ha. Fifteen species nested both

years, with the most common being, in order, the red-winged blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), long-billed marsh wren (*Cistothorus palustris*), yellow warbler (*Dendroica petechia*), and common yellowthroat (*Geothlypis trichas*). The highest density of breeding birds was found in the estuarine wetlands; however, the greatest diversity was in the upland areas where vegetation diversity and cover were greater.

Experimental plots to study growth of grasses and legumes at different levels of lime application were planted in August 1976. Four grasses including tall fescue (*Festuca elatior*), orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*), and perennial ryegrass (*Lolium perenne*) and two legumes - red clover (*Trifolium pratense*) and white clover (*Trifolium repens*) were planted with three replicates each of four lime treatments (control, and 3.6, 5.4, and 7.2 metric tons per 0.4 ha). From observations made about six weeks later it was clear that lime improved coverage and growth of all species. However, it was too early to evaluate optimal lime levels for any of the test species.

PREFACE

The work described in this report was performed under Contract No. DACW33-76-C-0017 between Connecticut College, New London, Connecticut, and the U. S. Army Engineer Division, New England, which administered the contract for the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi. The research was sponsored by the Office, Chief of Engineers, under the Dredged Material Research Program (DMRP).

The principal investigators were Drs. R. Scott Warren and William A. Niering for vegetation and floristics and Dr. William J. Barry for wildlife, all of Connecticut College. Field work for vegetation and floristics was under the immediate supervision of Mr. Mark J. McDonnell, now of the University of New Hampshire. The breeding bird study was done by Mr. Allen Carroll of East Haddam, Connecticut. This report was written by R. Scott Warren, William A. Niering, William J. Barry, and Allen L. Carroll with the extensive and invaluable editorial assistance of Mrs. Nancy C. Olmstead of the Connecticut Arboretum. The vegetation maps of Nott Island in Figures 3 and 4 were drafted by Ms. Lisa Bandazian of Canterbury, Connecticut.

The authors would like to thank the team of undergraduate field assistants: Richard Carr, Nora Holmquist, Daniel Murch, Anthony Nelson, Richard Newbold, Tina Siewers, Joan Tabachnick, Emily Wolfe, and Joan Zaprzalka. Without their careful and dedicated work, this study would not have been possible. Finally, Mrs. Rose Fishman and Mrs. Margaret Serluca, secretaries of the Botany and Zoology Departments, deserve thanks for their careful typing and preparation of the manuscript.

The report was prepared for the Habitat Development Project (HDP) of the DMRP (Dr. Hanley K. Smith, Manager) as part of Task 4B, "Terrestrial Habitat Development." The contract was managed by Ms. L. Jean Hunt who deserves special thanks for her help, encouragement, and patience throughout the course of this study. The contract was under the general supervision of Dr. J. Harrison, Chief of the Environmental Laboratory, WES.

Directors of WES during the study and preparation of this report were COL G. H. Hilt, CE, and COL J. L. Cannon, CE. Mr. F. R. Brown was Technical Director.

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HABITAT DEVELOPMENT FIELD INVESTIGATIONS, NOTT ISLAND
UPLAND HABITAT DEVELOPMENT SITE, CONNECTICUT RIVER, CONNECTICUT

APPENDIX B: SURVEY OF TERRESTRIAL ECOLOGY
AND PRELIMINARY BOTANICAL MONITORING

PART I: INTRODUCTION

Background

1. Nott Island, comprising about 31 ha, is located 11.2 km upstream from the mouth of the Connecticut River along the eastern shore of the main channel. Nearly 17 ha is upland, consisting of a mosaic of shrublands, grasslands, and unvegetated sand. A large, nearly 12 ha, estuarine wetland covers the southern portion of the island. The remaining space is the diked disposal area chosen for the upland habitat development field site.

2. From the colonial period until the early 1950's, the island was used for agriculture, principally as an area for hay crops and cattle pasture. The first disposal took place in 1936, and since then has occurred eight more times. In 1968, Nott Island was acquired by the State of Connecticut as a hunting preserve, and since then it has been under the management of the Wildlife Division of the Connecticut Department of Environmental Protection.

3. In February 1975, a sand dike enclosing the 3.1-ha site planned for the habitat development study was constructed in the north central portion of the island (Figure 1). The vegetation within the dike was primarily a switchgrass (*Panicum virgatum*) grassland, but also included a small black locust (*Robinia Pseudo-Acacia*) clone and other scattered trees. From February to April 1975 sandy dredged material was pumped into the disposal site. A view of the disposal site during filling is shown in Figure 2.

Previous Study

4. Prior to dredging and disposal, a detailed analysis of vegetation and a flora for the disposal area were prepared (Warren and Niering 1978). Preliminary small mammal trapping studies were conducted in

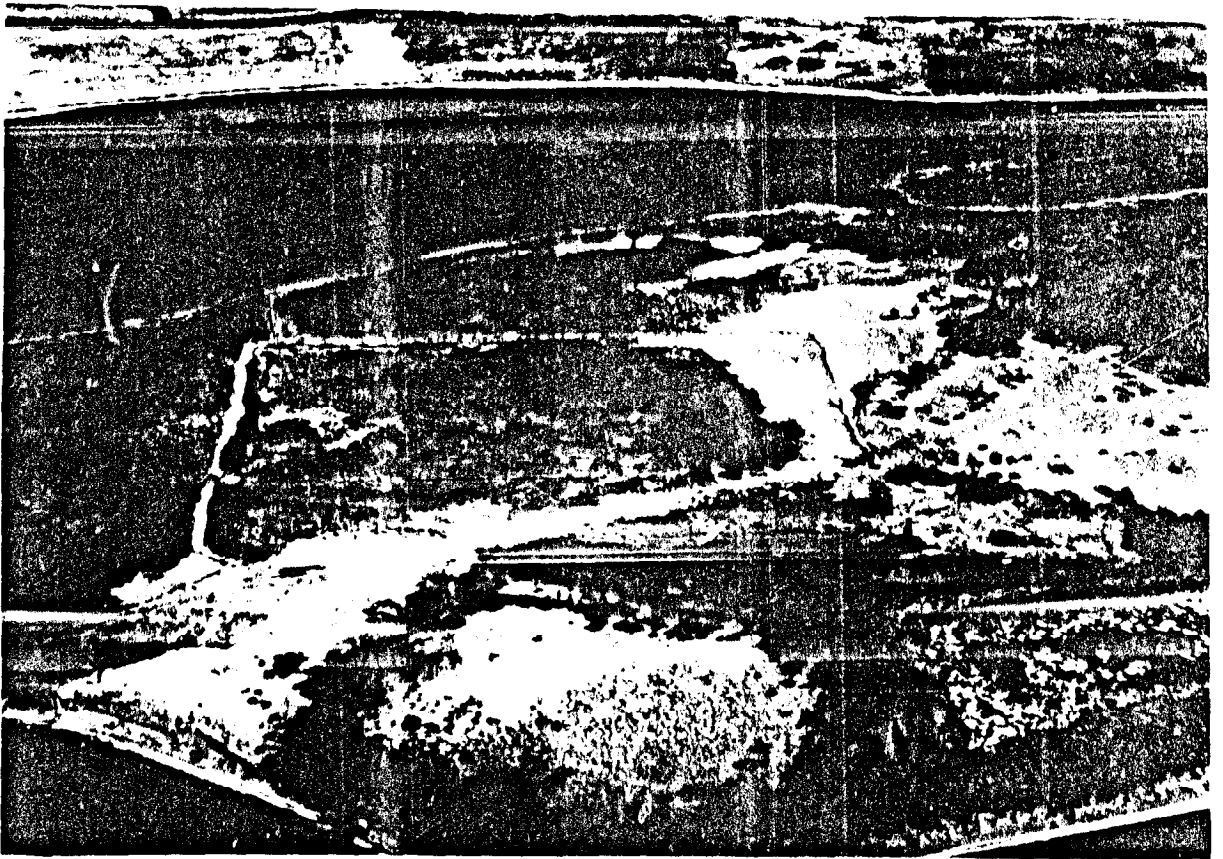


Figure 1. Oblique aerial view of Nott Island after dike construction
but before disposal operations



Figure 2. Ground view during initial stages of filling

September 1974 and again in March 1975, after the dike had been constructed but before the actual dredging operation had begun.

5. After disposal operations and during the spring and summer of 1975, a preliminary flora and vegetation map of the island was prepared. A breeding bird census was also taken and a year-round study of bird use of the island was initiated. From June to August 1975, the disposal site and other upland areas were intensively trapped for small mammals. The results of these initial studies have been presented in a previous report (Warren and Niering 1978).

Objectives

6. The primary purpose of this study was to develop a biotic description of Nott Island prior to the actual reclamation of the disposal site. This description would provide a baseline against which to monitor changes associated with the habitat development work. Field work, done in the summer of 1976, included census or sampling of vegetation, floristics, small mammals, and breeding birds, and observations of larger mammals and visiting birds. A small-scale microclimate study was also conducted in different vegetation types in order to compare temperature extremes and ranges.

7. A second objective was to establish and monitor experimental plots planted within the disposal area. This study sought to assess the success of establishment of different species of grass and legumes seeded under different levels of added lime.

PART II: DESCRIPTION OF VEGETATION PATTERNS
ANIMAL POPULATIONS, AND MICROCLIMATES

Vegetation

Methodology

8. The vegetation map prepared by the authors in 1975 (Warren and Niering 1978) and aerial photographs at 1:1200 taken by the New England Division in late summer of 1975 provided the basis of information for the 1976 vegetation study. Preparation of the 1976 vegetation map involved three major steps. First, the 1976 map and aerial photos were used to pick out distinct units of vegetation. Second, these units were identified and quantified by ground truth reconnaissance and quadrat sampling. Third, the detail (Figure 3) given by the individual units was considered impractical for most applications so units were pooled into 14 vegetation associations and mapped.

9. For the quadrat sampling, a minimum of five circular 5-m diameter quadrats was located within each unit of vegetation determined from the aerial photos and 1975 map. A total of 974 quadrats was sampled for this study. Within each quadrat, species were identified and grouped by trees, shrubs and vines, and herbs. Additional information recorded for each quadrat included: coded estimated percent cover for each species; heights of trees, shrubs, and herb strata; soil texture and moisture; and disturbance and animal activity. Note was made of any species in flower and a specimen was taken for the flora collections.

10. In addition to the field work conducted from mid-June to mid-August for the 1976 mapping and quantification of vegetation, collection trips were made biweekly to Nott Island throughout the early spring to obtain specimens of flowering plants. The inventories of plant species observed on Nott Island during 1975 and 1976 were combined into a master list (Appendix A').

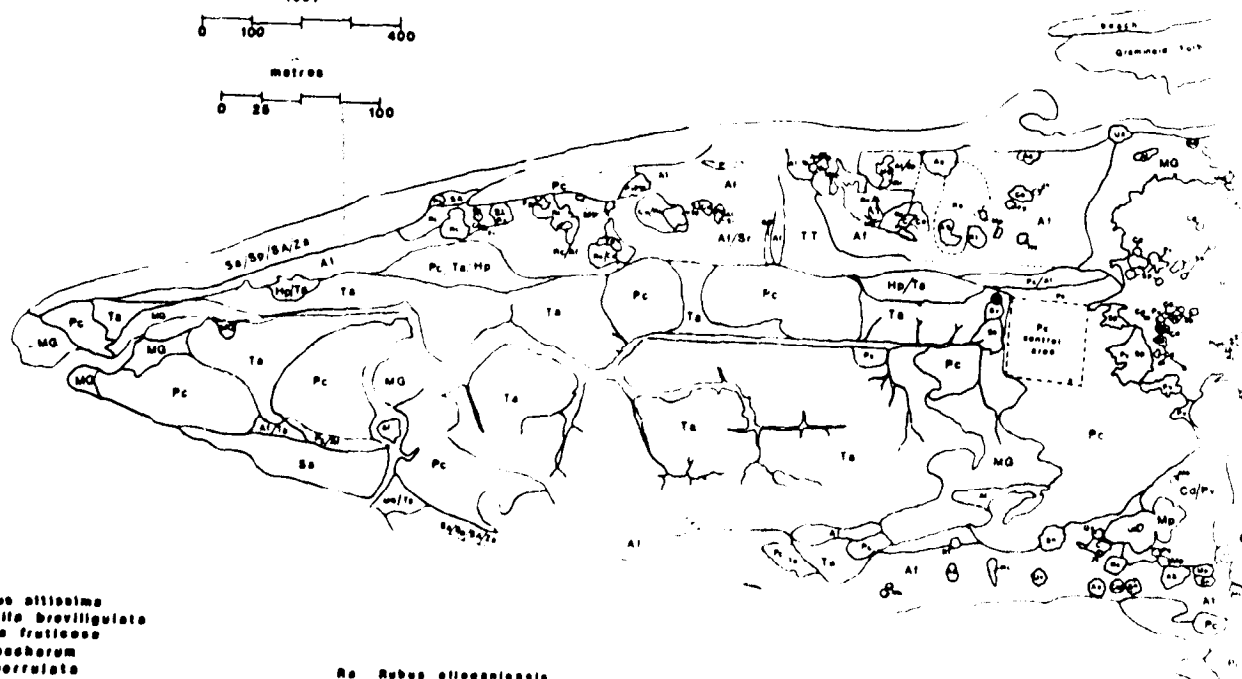
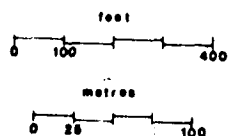
Results

11. The 14 major vegetation associations are mapped in Figure 4 and summarized on Table 1. The associations consist of eight upland types

NOTT ISLAND

LYME, CONNECTICUT

Scale 1:1200

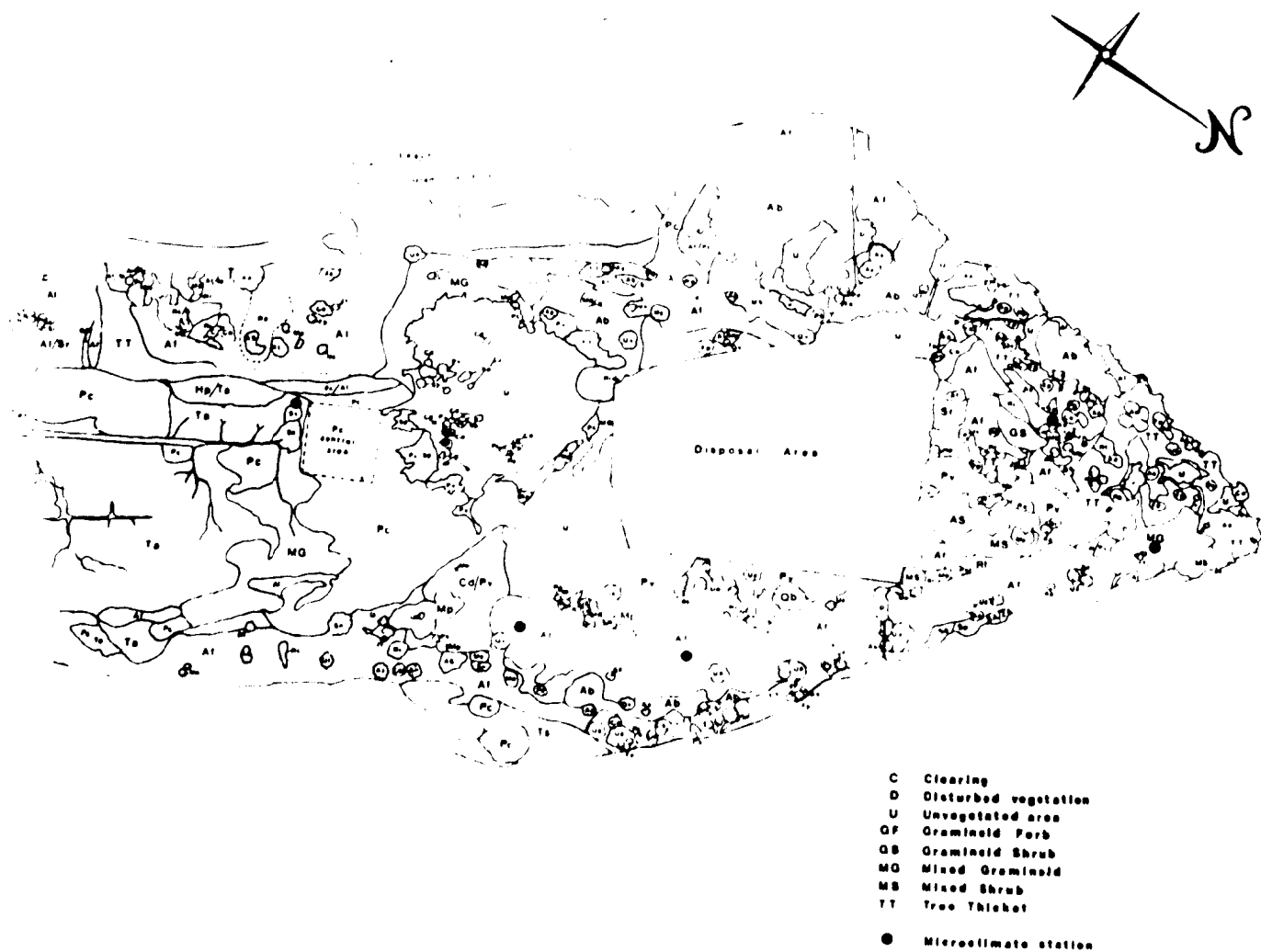


As *Alliethus altissimus*
 Ab *Ammophila brevifolius*
 A1 *Amorpha fruticosa*
 As *Acer saccharum*
 AS *Ainus serrulata*
 Cc *Cyperus dentatus*
 Co *Colostrium orbiculatus*
 Co *Catalpa speciosa*
 Cap *Crataegus* sp.
 Fp *Fraxinus pennsylvanica*
 FP *Fraxinus pennsylvanica*
 var. *subintegrifolia*
 Mp *Hibiscus palustris*
 Jap *Juniperus* sp.
 Jv *Juniperus virginiana*
 Mp *Myrica pennsylvanica*
 Pc *Phragmites communis*
 Pd *Populus deltoides*
 Ps *Prunus serotina*
 Pl *Populus tremuloides*
 Pr *Panicum virgatum*
 Ob *Quercus bicolor*
 Or *Quercus velutina*

Ra *Rubus alleghaniensis*
 Re *Rubus copallinus*
 Ri *Rubus flagellaris*
 Rp *Rubus pseudo-ovatus*
 Ri *Rubus typhina*
 Sa *Sorbus americana*
 SA *Spartina alterniflora*
 Sa *Salis nigra*
 Sp *Spartina patens*
 Sr *Solidago rugosa*
 Sv *Sorbus validus*
 Ta *Typha angustifolia*
 Ua *Ulmus americana*
 Vop *Vitis* sp.
 Za *Zizania aquatica*

* Current taxonomic use is now *Phragmites australis*

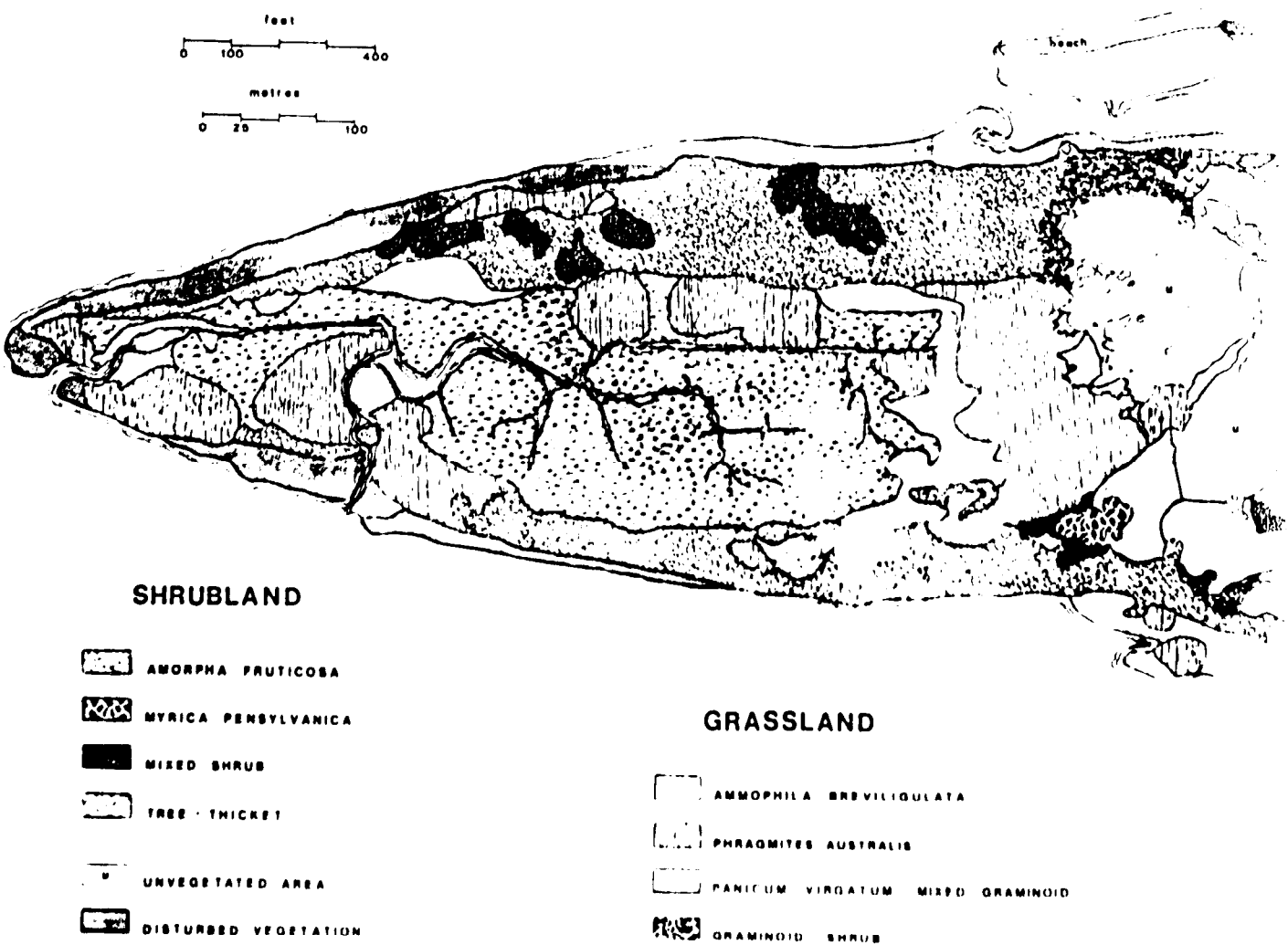
Figure 3. Detailed vegetation map of Nott Island



Detailed vegetation map of Nott Island

NOTT ISLAND

LYME, CONNECTICUT



JUNE 1978

Figure 4. Generalized vegetation map of Nott



GRASSLAND

- AMMOPHILA BREVILIGULATA
- PHRAGMITES AUSTRALIS
- PABICUM VIRGATUM - MIXED GRAMINOID
- GRAMINOID - SHRUB

ESTUARINE MARSH

- PHRAGMITES AUSTRALIS
- TYPHA ANGSTIFOLIA
- TYPHA ANGSTIFOLIA - FORBS
- GRAMINOID FORBS
- INTERTIDAL BORDER

Connecticut College Department of Botany

Figure 4. Generalized vegetation map of Nott Island

Table 1

Area and Percent Contribution of Major
Vegetation Associations of Nott Island

Vegetation Association	Total Area, ha	Percent of Total Area	Number of Quadrats
Shrublands	9.6	30.1	520
<i>Amorpha fruticosa</i>	6.5	20.4	299
Mixed shrub	1.4	4.4	96
<i>Myrica pensylvanica</i>	0.2	0.6	10
Tree-thicket	1.5	4.7	115
Grasslands	5.1	16.0	198
<i>Ammophila breviligulata</i>	1.8	5.6	
<i>Panicum virgatum</i> -Mixed graminoid	1.7	5.3	
Graminoid - Shrub	0.6	2.0	
<i>Phragmites australis</i>	1.0	3.1	
Estuarine wetlands	11.9	37.3	224
<i>Typha angustifolia</i>	4.4	13.8	69
<i>Phragmites australis</i>	3.3	10.3	65
<i>Typha</i> - Forb	0.8	2.5	13
Graminoid - Forb	1.5	4.7	43
Intertidal Border	1.9	6.0	34
Disturbed vegetation	0.1	0.3	32
Disposal Site	3.1	9.7	0
Unvegetated Areas	2.1	6.6	0
Total	31.9	100.0	974

of shrublands and grasslands and five types of estuarine wetlands. The fourteenth association is defined as disturbed vegetation. In all, 253 species of plants were recorded on Nott Island. A description and analysis of each of the fourteen associations is given in the following sections. A map of soil types is given in Figure 5.

Shrubland Associations

Amorpha fruticosa

12. The *Amorpha fruticosa* (false indigo) shrubland consists of three subtypes (*Amorpha/Solidago*, *Amorpha* wet phase, and *Amorpha*/Graminoid) and is the most extensive association on Nott Island, covering about 6.5 ha or 20 percent of the island's total area (Table 1). *Amorpha* shrubland occurs as an irregular 25- to 100-m-wide border above the intertidal zone along most of the eastern and western shores of the island (Figure 4). The association is characterized by thickets of dense indigo, 2 to 3 m tall, with the canopy providing 75 to 100 percent cover. The subtypes are distinguished by differences in the herbaceous layer, which in turn is largely a reflection of edaphic conditions. The *Amorpha* shrublands appear to represent the typical riparian vegetation on alluvial soils deposited on riverine islands such as Nott Island. Table 2 summarizes the quadrat for the three *Amorpha* subtypes and the following paragraphs describe each subtype.

13. *Amorpha/Solidago*. This is most extensive *Amorpha* subtype, covering most of the northern end of the island and a lobe extending to the southwest. The herbaceous cover is characterized by rough-edged goldenrod (*Solidago rugosa*), which was reported in 83 percent of the 191 quadrats sampled. Where it occurs, rough-edged goldenrod generally provides 25 to 50 percent of the herbaceous cover. Other herbs, which occurred in 20 percent or more of the 191 quadrats sampled, are common wintercress (*Barbarea vulgaris*), climbing false buckwheat (*Polygonum scandens*), wood-sage (*Teucrium canadense*), climbing hempweed (*Mikania scandens*), and pokeweed (*Phytolacca americana*). A variety of shrubs and vines also occur, particularly in the marginal areas, and include

NOTT ISLAND

LYME, CONNECTICUT

Scale 1:1200

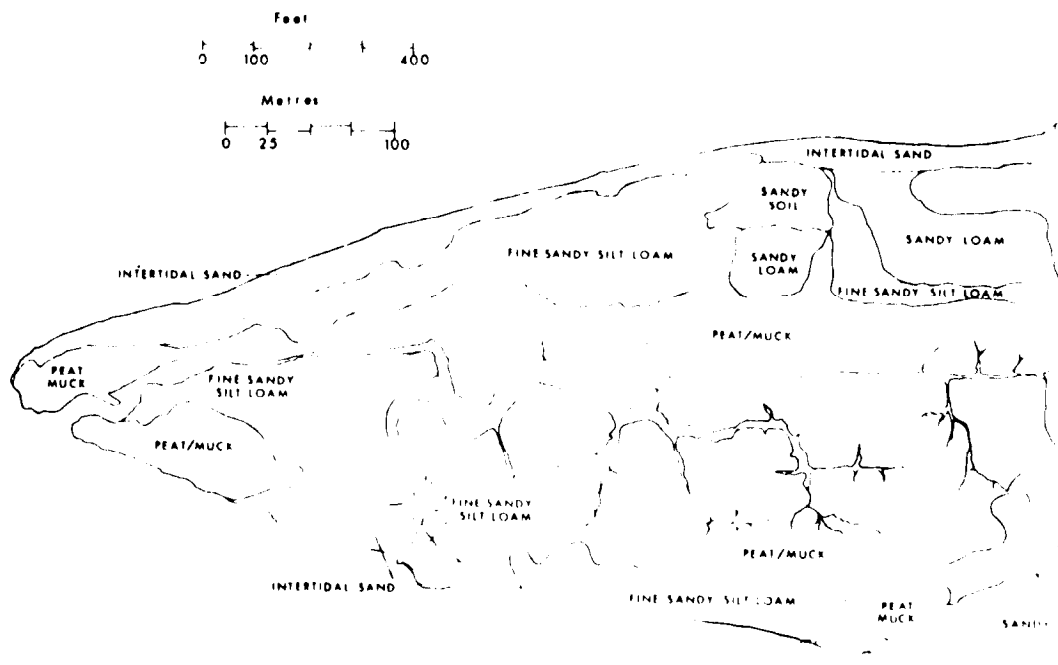


Figure 5. Soils



Figure 5. Soils map of Nott Island

Table 2
Summary of Quadrat Data for the Three Subtypes of *Amorpha fruticosa* Shrubland*

Life Form and Species	Amorpha/Solidago, 191 Quadrats				Subtype and Number of Quadrats Sampled				Amorpha/Grainoid, 36 Quadrats			
	Occurrence in Quadrats		Mean Coded Cover, Density**		Occurrence in Quadrats		Mean Coded Cover, Density**		Occurrence in Quadrats		Mean Coded Cover, Density**	
	Percent of		For		Percent of		For		Percent of		For	
	Number in Which Present	Total Sampled Frequency	Quadrats in Which Present	Total Sampled Frequency	Number in Which Present	Total Sampled Frequency	Quadrats in Which Present	Total Sampled Frequency	Number in Which Present	Total Sampled Frequency	Quadrats in Which Present	Total Sampled Frequency
Trees	57	30	4.4	1.3	11	15	3.7	0.6	4	11	2.8	
<i>Ailanthus altissima</i> Tree of heaven	17	9	3.9	0.4	2	3	5.0	0.1	0	0	0	
<i>Ulmus americana</i> American elm	11	6	3.9	0.7	1	1	3.0	0.1	0	0	0	
<i>Fraxinus pennsylvanica</i> Red ash	3	2	2.3	0.1	0	0	0	0	0	0	0	
<i>Juniperus virginiana</i> Red cedar	6	3	1.0	0.1	0	0	0	0	4	11	2.3	
Shrubs and Vines	191	100	5.7	5.7	70	97	5.4	5.2	36	100	5.4	
<i>Amorpha fruticosa</i> False indigo	175	92	4.8	4.4	69	96	4.4	4.2	33	92	4.2	
<i>Parthenocissus quinquefolia</i> Virginia creeper	77	40	2.0	0.8	9	13	1.8	0.2	5	14	1.8	
<i>Celastrus obcordatus</i> Oriental bittersweet	73	38	3.4	1.5	17	24	2.9	0.2	16	14	2.1	
<i>Rhus pennsylvanica</i> Bayberry	62	32	3.6	1.1	4	6	3.0	0.2	22	61	3.1	
<i>Rhus radicans</i> Poison ivy	43	23	2.5	0.6	8	11	2.4	0.3	11	31	3.7	
<i>Rhus copallina</i> Shining sumac	42	22	3.2	0.7	4	6	3.0	0.2	16	44	3.3	
Herbs	175	92	4.8	4.4	71	99	5.4	5.4	36	100	5.2	
<i>Solidago rugosa</i> Rough-edged goldenrod	159	83	4.0	3.4	14	19	2.6	0.5	25	69	3.0	
<i>Barbarea vulgaris</i> Common wintercress	97	51	2.2	1.1	29	40	2.0	0.8	6	17	0.2	
<i>Polygonum scandens</i> Climbing false buckwheat	77	51	1.9	0.9	21	29	1.6	0.5	20	55	1.4	
<i>Aucurium canadense</i> Wood-sage	63	33	3.3	1.1	36	50	3.0	1.5	15	42	2.3	
<i>Mikania scandens</i> Climbing hempweed	51	27	2.3	0.6	21	29	1.6	0.5	3	8	1.7	
<i>Hyptis americana</i> Pokeweed	40	21	2.1	0.4	7	10	1.6	0.2	0	0	0	
<i>Carex sp.</i> Sedge	16	8	2.5	0.2	27	36	3.0	1.1	4	17	5.0	
<i>Cirsium vulgare</i> Common thistle	22	12	1.6	0.2	0	0	0	0	10	28	1.9	
<i>Panicum virgatum</i> Switchgrass	0	0	0	0	0	0	0	0	9	23	3.9	
<i>Polygonum sagittatum</i> Arrow-leaved tearthumb	9	5	2.0	0.1	18	25	1.8	0.4	0	0	0	
<i>Spartina pectinata</i> Freshwater cordgrass	7	4	2.0	0.1	7	10	2.4	0.2	6	17	2.2	
<i>Juncus effusus</i> Soft rush	0	0	0	0	0	0	0	0	6	17	3.0	
<i>Impatiens capensis</i> Touch-me-knot	0	0	0	0	32	44	1.6	0.7	0	0	0	
<i>Pilea pumila</i> Clearweed	8	4	2.1	0.1	18	25	3.0	0.7	0	0	0	
<i>Hibiscus palustris</i> Marsh mallow	0	0	0	0	22	31	2.9	0.3	0	0	0	
<i>Polygonum punctatum</i> Water smartweed	26	15	1.6	0.2	24	33	2.5	0.8	2	6	3.0	

* Only the more frequently occurring species are included.

** For coded percent cover, the following classes were used: 0-14 (Cover = Class 1)

Virginia creeper (*Parthenocissus quinquefolia*), oriental bittersweet (*Celastrus orbiculatus*), bayberry (*Myrica pensylvanica*), poison ivy (*Rhus radicans*), and shining sumac (*Rhus copallina*). The most common scattered trees within the subtype are the tree of heaven (*Ailanthus altissima*), American elm (*Ulmus americana*), and red cedar (*Juniperus virginiana*). Soils are variable but are predominantly sand or sandy loam covered with a layer of organic material.

14. Amorpha wet phase. Most of the eastern and western margins of the estuarine marsh are *Amorpha* wet phase, the second most extensive *Amorpha* subtype. The *Amorpha* wet phase is also found locally within areas of the *Amorpha/Solidago* subtypes. Shrub density is lower here than in the other two *Amorpha* subtypes: only oriental bittersweet was recorded. The herbaceous layer is lush and extremely diverse. Woodsage occurred in half of the quadrats studied and made up 25 percent of the cover in those quadrats. Other herbaceous species that occurred in nearly 30 percent or more of the quadrats are: touch-me-not (*Impatiens capensis*), common wintercress, sedge (*Carex* sp.), water smartweed (*Polygonum punctatum*), marsh mallow (*Hibiscus palustris*), climbing hempweed, and climbing false buckwheat. Trees were reported in only 15 percent of the quadrats and were represented by only two species: tree of heaven and American elm. Wet phase *Amorpha* occurs most typically on dark, heavy wet, alluvial soil. To a lesser extent it is also found on wet sandy areas just above the intertidal zone.

15. Amorpha/Graminoid. The most limited of the *Amorpha* subtypes, the *Amorpha/Graminoid* is restricted to the northern end of the island where it has invaded red cedar associated clearings. These areas are usually fairly xeric. Several species occur within the shrub stratum. Besides indigo, bayberry, shining sumac, oriental bittersweet, and poison ivy were reported in 30 percent or more of the quadrats sampled. With the exception of oriental bittersweet those species made up nearly 25 percent of the cover in the quadrats in which they occurred. The herbaceous layer reflects the soil moisture conditions of the various sites. Rough-edged goldenrod and climbing false buckwheat were the most common species. In xeric areas, grasses such as switchgrass (*Panicum*

virgatum) and freshwater cordgrass (*Spartina pectinata*) are frequently encountered. At the more mesic sites, sedges became common. Trees were found in only 11 percent of the quadrats and red cedar was in all of these. Soils were typically dry and sandy. In the wetter areas soils were sandy but not of alluvial origin.

Mixed shrub

16. There are a variety of small, vegetationally distinct mixed shrubland areas that occur throughout Nott Island. Most are located north of the disposal area or along the southwestern upland arm. Four distinct subtypes are recognized within the mixed shrub association: shining sumac, dewberry (*Rubus flagellaris*), common alder (*Alnus serrulata*), and shrub-thicket. These four subtypes are described in the following paragraphs. Data for the mixed shrub association is given in Table 3 but is not broken out by subtypes. Trees were reported in less than half of the quadrats and contributed to about one percent of the cover. Herb species made up nearly 25 percent of the cover and occurred in 97 percent of the quadrats (Table 3).

17. Shining sumac. Areas dominated by shining sumac are most extensive on the southwestern upland arm within an *Amorpha* matrix. Scattered areas are also found north of the disposal site. In the shining sumac subtype, the shining sumac canopy is about 3 to 6 m high and makes up more than 50 percent of the cover. The only important shrub is indigo and only in the southern areas. Rough-edged goldenrod, about 1.5 m tall, is the dominant herb in the more mesic areas while a variety of graminoids are the most common herbs in the more xeric situations. Soil types are variable: to the south they tend to be sandy silt or sandy loam with a distinct layer of organic content and so are well drained.

18. Dewberry. There are two conspicuous dewberry areas on Nott Island. One is on the northeastern side of the disposal area between the alder wetland (described below) and dense *Amorpha* shrubland. The other site is southeast of the disposal area, and is more open, bordered along only on one side by *Amorpha*. Dewberry is found trailing along the ground, 5 to 25 cm high and, in these areas, contributes about 25 percent of the cover. Short indigo (1.5 m) is scattered within both

Table 3

Summary of Quadrat Data for the Mixed Shrub and Tree-Thicket Shrublands*

Life Form and Species	Association and Number of Quadrats Sampled							
	Mixed Shrub, 90 Quadrats				Tree-Thicket, 115 Quadrats			
	Occurrence in Quadrats		Mean Coded Cover, Density**		Occurrence in Quadrats		Mean Coded Cover, Density**	
	Number in Which Present	Number Sampled, Frequency	Number in Which Present	For Total Sampled	Number in Which Present	Percent Total Sampled, Frequency	Number in Which Present	For Total Sampled
	41	43	4.3	1.8	101	88	5.2	2.0
<i>Ailanthus altissima</i> Tree of heaven	13	14	3.6	0.4	42	37	4.7	1.7
<i>Juniperus virginiana</i> Red cedar	11	11	3.5	0.4	22	19	4.2	1.7
<i>Quercus velutina</i> Black oak	6	6	3.7	0.2	7	6	3.1	0.2
<i>Robinia pseudo-acacia</i> Black locust	0	0	0	0	12	10	4.4	0.2
<i>Ulmus americana</i> American elm	0	0	0	0	14	12	4.2	0.2
<i>Fraxinus pensylvanica</i> Red ash	0	0	0	0	9	8	4.9	0.2
<i>Salix</i> spp. Willow	0	0	0	0	9	9	4.5	0.2
<i>Prunus serotina</i> Wild black cherry	4	4	4.0	0.2	9	8	4.3	0.2
Shrubs and Vines	96	100	5.8	5.8	115	100	5.8	5.8
<i>Amorpha fruticosa</i> False indigo	84	88	3.7	3.2	81	70	3.6	2.9
<i>Celastrus orbiculatus</i> Oriental bittersweet	60	63	3.5	2.2	99	86	4.1	3.9
<i>Rhus copallina</i> Shining sumac	46	48	3.7	1.8	13	11	2.5	0.9
<i>Myrica pensylvanica</i> Bayberry	34	35	3.1	1.1	30	26	3.5	0.9
<i>Rhus radicans</i> Poison ivy	32	33	2.7	0.9	55	48	3.3	1.7
<i>Parthenocissus quinquefolia</i> Virginia creeper	30	31	2.1	0.7	75	65	2.4	1.6
<i>Cubus flagellaris</i> Dewberry	13	14	4.8	0.7	24	21	2.9	0.9
<i>Alnus serrulata</i> Common alder	6	6	4.8	0.2	0	0	0	0
Herbs	93	97	3.8	3.7	96	83	3.5	2.9
<i>Helidago rugosa</i> Rough-edged goldenrod	66	69	3.5	2.4	57	50	2.7	1.8
<i>Polygonum scandens</i> Climbing false buckwheat	34	35	2.0	0.7	25	22	2.6	0.6
<i>Carex</i> spp. Sedge	20	21	3.1	0.6	12	10	2.4	0.4
<i>Eulichium virgatum</i> Switchgrass	20	21	2.0	0.4	25	22	2.3	0.9
<i>Spartina pectinata</i> Freshwater cordgrass	19	19	1.1	0.2	0	0	0	0
<i>Panicum clandestinum</i> Panic grass	20	30	2.2	0.7	26	23	2.3	0.9
<i>Solanum dulcamara</i> Nightshade	1	1	2.0	< 0.1	22	19	1.8	0.9

* Only the more frequently occurring species are included.
 ** For coded percent cover, the following classes were used:

< 1% Cover	= Class 1
1-5%	= 2
5-25%	= 3
25-50%	= 4
50-75%	= 5
75-100%	= 6

dewberry areas. Rough-edged goldenrod and xeric graminoids also occur. Soils tend to be dry and quite sandy.

19. Common alder. There is a dense thicket of alder north of the disposal area and just east of the center of the island. Multi-stemmed, 4- to 6-m tall alders make up 100 percent of the cover except along the margins of the stand. Here, indigo and bayberry are important shrub associates. Total herbaceous cover is 40 to 60 percent in the margins and decreases toward the center of the thicket. Sedges and grasses are the most common herbs but no one species is clearly dominant. The water table is at or near the surface and soils are wet or moist sandy loam covered by 5 cm of organic matter.

20. Shrub-thicket. Areas of shrub-thicket occur within the *Amorpha* association of the southwestern arm and in shrubland mosaic north of the disposal site. The dominant species in the shrub-thicket subtype areas varies but the commonly found shrubs include oriental bittersweet, indigo, shining sumac, poison ivy, and bayberry. Trees occur in about 40 percent of the quadrats in this subtype with tree of heaven and red cedar being the most common. The herbaceous layer is dominated by rough-edged goldenrod and panic grass (*Panicum clandestinum*). Soils are extremely variable and cannot be generalized.

Myrica pensylvanica

21. There are six large, pure clones of bayberry (1 to 2 m in height) on Nott Island and these are designated as a separate vegetation unit. They occur at the borders of the grasslands and the mixed shrub association. There are virtually no associated species within the dense centers of these areas and they exhibit a remarkable ability to withstand tree invasion. Vegetation along the margins of the bayberry area is highly variable, reflecting the surrounding vegetation associations.

Tree-thicket

22. The tree -thicket association is extensive along the northwestern shore of Nott Island also occurs along an area of shore due east of the disposal area (Figure 4). Quadrat data for the tree-thicket areas is given in Table 3. Vegetationally these areas are characterized by well-established trees, most of which are typically floodplain species.

These include American elm, ash (*Fraxinus* sp.), and willow (*Salix* sp.). Other typically floodplain species of trees that were observed in the areas but were not included in the quadrat samples are cottonwood (*Populus deltoides*), black gum (*Nyssa sylvatica*), and silver maple (*Acer saccharinum*). The most frequently occurring tree was tree of heaven, which was reported in 37 percent of the quadrats (Table 3). Other commonly encountered tree species are red cedar, black cherry (*Prunus serotina*), and black locust (*Robinia Pseudo-Acacia*). The black cherry is indicative of the old field/postagricultural nature of the island.

23. Although there is considerable diversity in the shrub stratum, false indigo and three woody vines (oriental bittersweet, virginia creeper, and poison ivy) occur most frequently. The herbaceous cover is greatly reduced because vines occupy much of the herb stratum. Rough-edged goldenrod is most common and occurred in half of the quadrats (Table 3). Switchgrass and panic grass also occur commonly, but in clumps and so do not contribute much to overall cover.

Grassland Associations

Ammophila breviligulata

24. Areas of this grassland occupy what appear to be sandy dredged material from previous disposal operations and occur only on the northern half of Nott Island (Figure 4). Although the density of its cover varies, the beach grass (*Ammophila breviligulata*) is nearly pure; other herbs are found only along the margins and are characteristic of the adjoining vegetation association. Lichens (*Cladonia* sp.) are fairly common. Shrubs are scattered, usually in depressions, and often appear stunted. The most common shrubs are shining sumac, poison ivy, and bayberry. Trees rarely occur and only along the margins. Quadrat data are given in Table 4.

Panicum virgatum - mixed graminoid

25. Areas of this grassland occur around the disposal site, primarily on the eastern half of Nott Island (Figure 4). Soils are dry and sandy with little organic content and probably result from

Table 4

Summary of Quadrat Data for All Four Grassland Associations Combined*

Life Form and Species	Occurrence in 198 Quadrats		Mean Coded Cover, Density**	
	Number in Which Present	Percent of Total Sampled, Frequency	Quadrats in Which Present	For Total Sample
Trees	25	13	3.6	0.4
<u>Ailanthus altissima</u> Tree of heaven	12	6	3.5	0.2
<u>Juniperus virginiana</u> Red cedar	5	3	2.4	0.1
<u>Ulmus americana</u> American elm	4	2	3.5	0.1
<u>Quercus velutina</u> Black oak	3	2	2.7	
Shrubs				
<u>Amorpha fruticosa</u> False indigo	87	44	2.9	1.3
<u>Celastrus orbiculatus</u> Oriental bittersweet	47	24	2.9	0.7
<u>Rhus copallina</u> Shining sumac	45	23	2.7	0.6
<u>Myrica pensylvanica</u> Bayberry	38	19	2.8	0.5
<u>Rosa spp.</u> Rose, blackberry	24	12	2.5	0.3
<u>Rhus radicans</u> Poison ivy	23	12	2.3	0.3
<u>Rhus typhina</u> Staghorn sumac	22	11	2.2	0.2
Herbs	198	100	5.8	5.8
<u>Panicum virgatum</u> Switchgrass	104	52	3.2	1.7
<u>Ammophila breviligulata</u> Beachgrass	69	35	4.8	1.7
<u>Panicum clandestinum</u> Panic grass	70	35	3.7	1.3
<u>Spartina pectinata</u> Freshwater cordgrass	61	31	2.6	0.8
<u>Solidago rugosa</u> Rough-edged goldenrod	85	43	2.8	1.2
<u>Oenothera parvifolia</u> Evening primrose	34	17	1.6	0.3
<u>Carex spp.</u> Sedge	26	13	3.5	0.5
<u>Leptoloma cognitum</u> Fall witch-grass	26	13	3.1	0.4
<u>Verbascum Thapsis</u> Common mullein	21	11	1.7	0.2
<u>Cyperus dentatus</u> Umbrella-sedge	21	11	3.5	0.1
<u>Phragmites australis</u> Common reed	18	9	3.5	0.3
<u>Agropyron repens</u> Witch-grass	18	9	2.1	0.2
<u>Achillia Millefolium</u> Common yarrow	17	9	1.9	0.2

* Only the more frequently occurring species are included.

** For coded percent cover, the following classes were used:

< 1% Cover	=	Class 1
1-5%	=	2
5-25%	=	3
25-50%	=	4
50-75%	=	5
75-100%	=	6

old dredged material. Switchgrass, the dominant species, grows to 1 to 1½ m high. Other common herbaceous species include panic grass, umbrella sedge, freshwater cordgrass, rough-edged goldenrod, and clumps of reedgrass (*Phragmites australis*) and beach grass. Shrubs are not important in this grassland. Dewberry is sometimes found as a ground cover between tussocks of switchgrass. Poison ivy and shining sumac occur as widely scattered individuals and small clumps, and indigo is found along the margins. Trees rarely occur, but there are a few scattered American elm, tree of heaven, and black oak (*Quercus velutina*).

Graminoid -- shrub

26. The largest area of this grassland lies southwest of the disposal site and forms a transition zone 20 to 50 m wide between unvegetated sand and the *Amorpha fruticosa* shrubland association (Figure 4). Smaller patches are found southeast and north of the disposal site. In most of the areas shrub cover appears to be increasing over grass cover. The shrub stratum is typically discontinuous, covering about 50 percent of the areas while grasses cover about 80 percent. Floristically, this association is quite variable with some species occurring in only a few locations. The most widespread grasses are switchgrass and freshwater cordgrass with panic grass, beach grass, and witch grass as important associates. The dominant herb is rough-edged goldenrod, although evening primrose (*Oenothera parvifolia*) and sedge are also frequently encountered. The shrub layer is characterized by shining sumac, poison ivy, and indigo. Other, less frequently occurring shrubs are bayberry and oriental bittersweet. Trees, red cedar and tree of heaven, are few and scattered.

Phragmites australis

27. Reedgrass appears on Nott Island in two different associations, grassland (dry phase) and estuarine wetland (wet phase), but the two are not differentiated on the vegetation map (Figure 4). The dry phase occurs on relatively dry upland sites along the upper border of the wet phase in a belt about 25 to 50 m wide, and is less extensive than the wet phase. It also occurs in a narrow 2- to 40-m belt along the upland edge of the head of the western inlet. The dry phase reedgrass generally

forms a monoculture, 2 to 3 m in height, but at its northernmost extension into the dry, sandy, unvegetated central area of the island, it becomes increasingly stunted and is less than a meter high in places. Where the dry phase borders the *Amorpha fruticosa* shrubland, additional species are associated with the reedgrass, including rough-edged goldenrod.

Estuarine Wetland Associations

Typha angustifolia

28. The *Typha angustifolia* association covers 4.4 ha, or nearly 14 percent of Nott Island (Table 1). It is the most extensive wetland association and the second most extensive of the vegetation types on Nott Island. This association occurs in the tidally flooded expanse between the southwest and southeast arms of the *Amorpha fruticosa* shrubland (Figure 4). There, stands of narrow-leaved cattail (*Typha angustifolia*) are relatively pure, provide nearly 100 percent coverage, and are 2.0 to 2.5 m high in the interior of the marsh and 1.5 m high along creek banks. Within the marsh the monoculture is broken only by occasional clumps of marsh mallow. Along creek banks a variety of aquatics occur in association with narrow-leaved cattail including water hemp (*Acnida cannabin*), arrow arum (*Peltandra virginica*), and stinkweed (*Pluchea purpurascens*). Additional wetland herbs are limited to forage areas surrounding muskrat houses. Where the *Typha* wetland association borders the *Phragmites* wetland association, the reedgrass appears to be invading the cattails. Quadrat data are given in Table 5.

Phragmites australis

29. Extensive areas of the wet phase association of reedgrass occur at the southern end of Nott Island and as a border along the northern head of the central marsh. Additional areas are scattered within the *Typha angustifolia* association and other tidally influenced sites on the southern two-thirds of the island. Most of these islands appear to be spreading into the surrounding wetland types. In its wet phase, reedgrass occurs in very dense stands, reaching heights of 4.5 m in the central sections and up to 3 m along tidal creeks and ditches. Associated

Table 5
Summary of quadrat data for Estuarine Wetland Associations*

Life Form and Species	Occurrence in Quadrats		Mean Coded Cover, Density**	
	Number In Which Present	Percent of Total Sampled, Frequency	Quadrats In Which Present	For Total Sampled
a. <i>Typha angustifolia</i> , 69 Quadrats				
Shrubs	9	13	2.0	0.3
<i>Amorpha fruticosa</i> False indigo	9	13	2.0	0.3
Herbs	69	100	6.0	6.0
<i>Typha angustifolia</i> Narrow-leaved cattail	69	100	5.5	5.5
<i>Mikania scandens</i> Climbing hempweed	36	52	1.5	0.8
<i>Polygonum punctatum</i> Water-smartweed	36	52	1.7	0.5
<i>Hibiscus palustris</i> Marsh mallow	32	46	3.1	1.4
<i>Peltandra virginica</i> Arrow arum	28	41	2.7	1.1
<i>Pluchea purpurascens</i> Stinkweed	22	32	1.7	0.6
<i>Scirpus americanus</i> Three-square	18	26	3.4	0.9
<i>Galium</i> spp. Bedstraw	15	21	1.9	0.4
<i>Ptilimnium capillaceum</i> Mock bishop's weed	14	20	1.9	0.4
<i>Eleocharis</i> spp. Spike-rush	13	19	3.4	0.6
<i>Phragmites australis</i> Common reed	13	19	1.7	0.3
<i>Impatiens capensis</i> Touch-me-not	14	20	1.4	0.3
<i>Lophotocarpus spongiosus</i> Hooded arrowhead	7	10	1.5	0.1
<i>Spartina pectinata</i> Freshwater cordgrass	1	1	1.0	<0.1
<i>Cicuta bulbifera</i> Water-hemlock	3	4	1.0	<0.1
<i>Lycopus americanus</i> Bugleweed	5	7	1.8	0.1
b. <i>Phragmites australis</i> , 65 Quadrats				
Shrubs	20	31	3.2	1.0
<i>Amorpha fruticosa</i> False indigo	20	31	3.2	1.0
Herbs	65	100	5.8	5.8
<i>Typha angustifolia</i> Narrow-leaved cattail	17	26	2.1	0.6
<i>Mikania scandens</i> Climbing hempweed	37	57	1.8	1.0
<i>Polygonum punctatum</i> Water-smartweed	20	31	1.7	0.5
<i>Hibiscus palustris</i> Marsh mallow	20	31	2.7	0.8
<i>Peltandra virginica</i> Arrow arum	28	43	2.0	0.9
<i>Pluchea purpurascens</i> Stinkweed	5	7	1.6	0.1
<i>Scirpus americanus</i> Three-square	5	7	3.0	0.2
<i>Galium</i> spp. Bedstraw	13	20	1.7	0.3
<i>Ptilimnium capillaceum</i> Mock bishop's weed	11	17	1.5	0.2
<i>Eleocharis</i> spp. Spike-rush	9	14	3.1	0.4
<i>Phragmites australis</i> Common reed	65	100	5.8	5.8
<i>Impatiens capensis</i> Touch-me-not	25	38	2.4	0.9
<i>Acnida cannabina</i> Water-hemp	3	5	1.0	<0.1
<i>Lythrum Salicaria</i> Spiked loosestrife	15	23	1.8	0.4
<i>Lycopus americanus</i> Bugleweed	3	5	1.7	0.1
<i>Panicum virgatum</i> Switchgrass	7	10	3.3	0.4

(Continued)

* Only the more frequently occurring species are included.

** For coded percent cover, the following classes were used:

% Cover	Class
1-5%	1
6-25%	2
26-50%	3
51-75%	4
76-100%	5

Table 5. (Continued)

Life Form and Species	Occurrence in Quadrats		Mean Cover Density	
	Number in which Present	Percent of Total Sampled Frequency	Quadrats in Which Present	For Total Sampled
<u>c. Typha Forb, 13 Quadrats</u>				
Shrubs	3	23	2.7	0.6
<u>Amorpha fruticosa</u> False indigo	3	23	2.7	0.6
Herbs	13	100	5.8	5.8
<u>Typha angustifolia</u> Narrow-leaved cattail	10	77	4.1	3.2
<u>Mikania scandens</u> Climbing hempweed	9	69	1.7	1.2
<u>Polygonum punctatum</u> Water-smartweed	9	69	2.1	1.5
<u>Hibiscus palustris</u> Marsh mallow	4	31	3.5	1.1
<u>Peltandra virginica</u> Arrow arum	6	46	2.3	1.1
<u>Pluchea purpurascens</u> Stinkweed	9	69	1.4	1.0
<u>Scirpus americanus</u> Three-square	8	62	3.1	1.9
<u>Galium spp.</u> Redstraw	3	23	2.7	0.6
<u>Ptilimnium capillaceum</u> Mock bishop's weed	2	15	1.0	0.2
<u>Eleocharis spp.</u> Spike-rush	8	62	4.2	2.6
<u>Phragmites australis</u> Common reed	4	31	1.8	0.5
<u>Impatiens capensis</u> Touch-me-not	5	38	1.4	0.5
<u>Lophotocarpus spongiosus</u> Hooded arrowhead	3	23	1.3	0.3
<u>Spartina pectinata</u> Freshwater cordgrass	2	15	2.0	0.3
<u>Scirpus validus</u> Great bulrush	1	8	3.0	0.2
<u>Zizania aquatica</u> Wild rice	1	8	5.0	0.4
<u>Cicuta bulbifera</u> Water-henlock	2	15	4.0	0.6
<u>Acnida cannabina</u> Water-hemp	3	23	1.0	0.1
<u>Juncus acuminatus</u> Rush	3	23	2.3	0.5
<u>Lythrum Salicaria</u> Spiked loosestrife	9	69	2.3	1.6
<u>Lycopus americanus</u> Bugleweed	3	23	1.0	0.2
<u>d. Graminoid-Forb</u>				
Shrubs	4	9	1.3	0.1
<u>Amorpha fruticosa</u> False indigo	4	9	1.3	0.1
Herbs	43	100	5.9	5.9
<u>Typha angustifolia</u> Narrow-leaved cattail	19	44	2.9	1.3
<u>Mikania scandens</u> Climbing hempweed	14	33	1.4	0.5
<u>Polygonum punctatum</u> Water-smartweed	20	47	2.2	1.0
<u>Hibiscus palustris</u> Marsh mallow	12	28	2.7	0.7
<u>Peltandra virginica</u> Arrow arum	7	16	2.1	0.3
<u>Pluchea purpurascens</u> Stinkweed	29	67	2.4	1.6
<u>Scirpus americanus</u> Three-square	34	79	3.5	2.8
<u>Galium spp.</u> Bedstraw	14	33	2.4	0.8
<u>Ptilimnium capillaceum</u> Mock bishop's weed	17	40	2.6	1.0
<u>Eleocharis spp.</u> Spike-rush	33	77	3.6	2.7
<u>Phragmites australis</u> Common reed	11	26	2.4	0.6
<u>Lophotocarpus spongiosus</u> Hooded arrowhead	31	72	2.5	0.9
<u>Spartina pectinata</u> Freshwater cordgrass	20	47	2.9	1.3
<u>Scirpus validus</u> Great bulrush	15	35	3.2	1.1
<u>Zizania aquatica</u> Wild rice	10	23	2.7	0.6
<u>Cicuta bulbifera</u> Water-henlock	9	21	1.3	0.3
<u>Acnida cannabina</u> Water-hemp	9	21	1.1	0.2
<u>Juncus acuminatus</u> Rush	8	19	3.1	0.6
<u>Lythrum Salicaria</u> Spiked loosestrife	7	16	1.6	0.3

(Continued)

Table 5 (Concluded)

Life Form and Species	Occurrence In		Mean Coded		
	Quadrats		Cover, Density		
	Number in Which Present	Percent of Total Sampled Frequency	For Quadrats in Which Present	For Total Sampled	
d. Graminoid-Forb (continued)					
<u>Lycopus americanus</u>	Bugleweed	2	5	1.0	<0.1
<u>Panicum virgatum</u>	Switchgrass	3	7	5.6	0.4
<u>Scirpus robustus</u>	Bulrush	2	5	1.0	0.5
e. Intertidal Border					
Shrubs		2	6	1.5	0.1
<u>Amorpha fruticosa</u>	False indigo	2	6	1.5	0.1
Herbs		33	97	5.6	5.4
<u>Typha angustifolia</u>	Narrow-leaved cattail	5	15	2.8	0.4
<u>Mikania scandens</u>	Climbing hempweed	5	15	1.2	0.2
<u>Polygonum punctatum</u>	Water-smartweed	7	21	1.7	0.4
<u>Peltandra virginica</u>	Arrow arum	10	29	1.2	0.4
<u>Pluchea purpurascens</u>	Stinkweed	23	68	2.1	1.4
<u>Scirpus americanus</u>	Three-square	32	94	4.1	3.9
<u>Eleocharis spp.</u>	Spike-rush	15	44	3.0	1.3
<u>Phragmites australis</u>	Common reed	15	44	2.9	1.3
<u>Lophotocarpus spongiosus</u>	Hooded arrowhead	12	35	1.5	0.8
<u>Spartina pectinata</u>	Freshwater cordgrass	23	68	3.5	2.4
<u>Scirpus validus</u>	Great bulrush	5	15	2.8	0.4
<u>Zizania aquatica</u>	Wild rice	8	24	3.4	0.8
<u>Acnida cannabina</u>	Water hemp	8	24	1.1	0.3
<u>Lythrum Salicaria</u>	Spiked loosestrife	7	21	1.6	0.3
<u>Spartina alterniflora</u>	Saltwater cordgrass	2	6	2.5	0.1
<u>Panicum virgatum</u>	Switchgrass	12	35	2.5	0.9
<u>Scirpus robustus</u>	Bulrush	6	18	1.3	0.3

herbaceous species rarely occur, but are generally within 2 to 3 m of the edge of the reedgrass stands. These species include marsh mallow, touch-me-not, arrow arum, water smartweed, and narrow-leaved cattail. At the higher and more isolated areas of the larger reedgrass stands, climbing hempweed and indigo occur with up to 50 percent cover. These are probably relic areas because reedgrass appears to be invading the bordering *Amorpha fruticosa* shrubland as well as other adjacent wetland associations. Quadrat data are given in Table 5.

Typha - Forb

30. There are four cattail dominated areas of wetland on Nott Island in which a variety of forbs and grasses make a substantial contribution to the vegetation. These areas are recognized as a distinct association. The most common species occurring with cattail in this association are bulrush (*Scirpus americanus*), spikerush (*Elocharis* sp.), water smartweed, stinkweed, and arrow arum (Table 5). Spiked loosestrife (*Lythrum salicaria*), an introduced species, and climbing hempweed are found on higher, often sandier sites. Isolated clumps of marsh mallow also occur.

31. Two areas of *Typha*-Forb lie along the island's eastern shore and a third in the inlet formed by the sand spit beach on the western side of the island. The fourth area, at the northwestern corner of the central *Typha angustifolia* wetland, may represent older muskrat forage areas that are sufficiently open to favor a greater diversity of aquatic plants than can be found in dense stands of cattail.

Graminoid - Forb

32. These low wetlands are widely scattered through Nott Island's tidal marshes. They are found in protected areas behind the mouth of the two southern tidal creeks and in an irregular band at the head of the central marsh where it separates *Typha angustifolia* wetland from *Phragmites australis* wetland (Figure 4). Another extensive area occurs along protected shores of the embayment formed by the western sand spit beach. The soils in the graminoid - forb association are typically very wet muck; in the embayment area, varying amounts of sand are also present. Floristically, this association is extremely diverse but only bulrush,

spikerush, hooded arrowhead (*Lophotocarpus spongiosus*), and stinkweed occurred in more than 50 percent of the sampled quadrats (Table 5). Other plants that are commonly found or that dominate in places include freshwater cordgrass, water smartweed, narrow-leaved cattail, mock bishop's weed (*Ptilimnium capillaceum*), soft-stemmed bulrush (*Scirpus validus*), wild rice (*Zizania aquatica*), and rushes (*Juncus acuminatus*).

Intertidal border

33. The southern half of the western and eastern shores and areas along the northeastern shore support a distinct association on a sandy, alluvial substrate (Figure 4). Approximately half of the total cover is contributed by bulrush, which occurred in 94 percent of the quadrats sampled. Freshwater cordgrass is also widespread and provided about 35 percent of the cover in the quadrats in which it occurred (Table 5). Saltwater cordgrass (*Spartina alterniflora*) and wild rice are common at the southern end of the island and combine to give about 20 percent of the total cover within the intertidal border there. Commonly associated forbs are water hemp and stinkweed. Common graminoids are panic grass and reedgrass.

Disturbed Vegetation Association

34. There are four strips of land radiating from the northwestern and northeastern sides of the disposal area that were subjected to heavy equipment traffic during the disposal operation. This disturbance opened the sites, and several species became established. Most common of these invaders are sedges, pigweed (*Chenopodium* sp.), and evening primrose. Rough-edged goldenrod and panic grass are also common. The balance of the floristic composition of the disturbed areas reflects the vegetation established before disposal and cannot be generalized.

Small Mammals

Methodology

35. The areas bordering the disposal site were divided into five

trapping grids: Northeast, Northwest, East, West, and South (Figure 6). The boundaries of the Northeast, Northwest, and West grids all extended to the shore of the island. The boundaries of both the East and South grids were arbitrarily decided upon considering both the time and number of traps available.

36. Each grid was laid out in 15-m squares by a team of three individuals using a 30-m tape and hand compass. Trap stations were established on the intersections of the squares. The grid areas and number of traps per grid were:

Grid	Area, ha	Number of Traps
Northeast	2.16	95
Northwest	1.58	67
East	2.02	93
West	2.55	120
South	2.07	101
	10.38	476

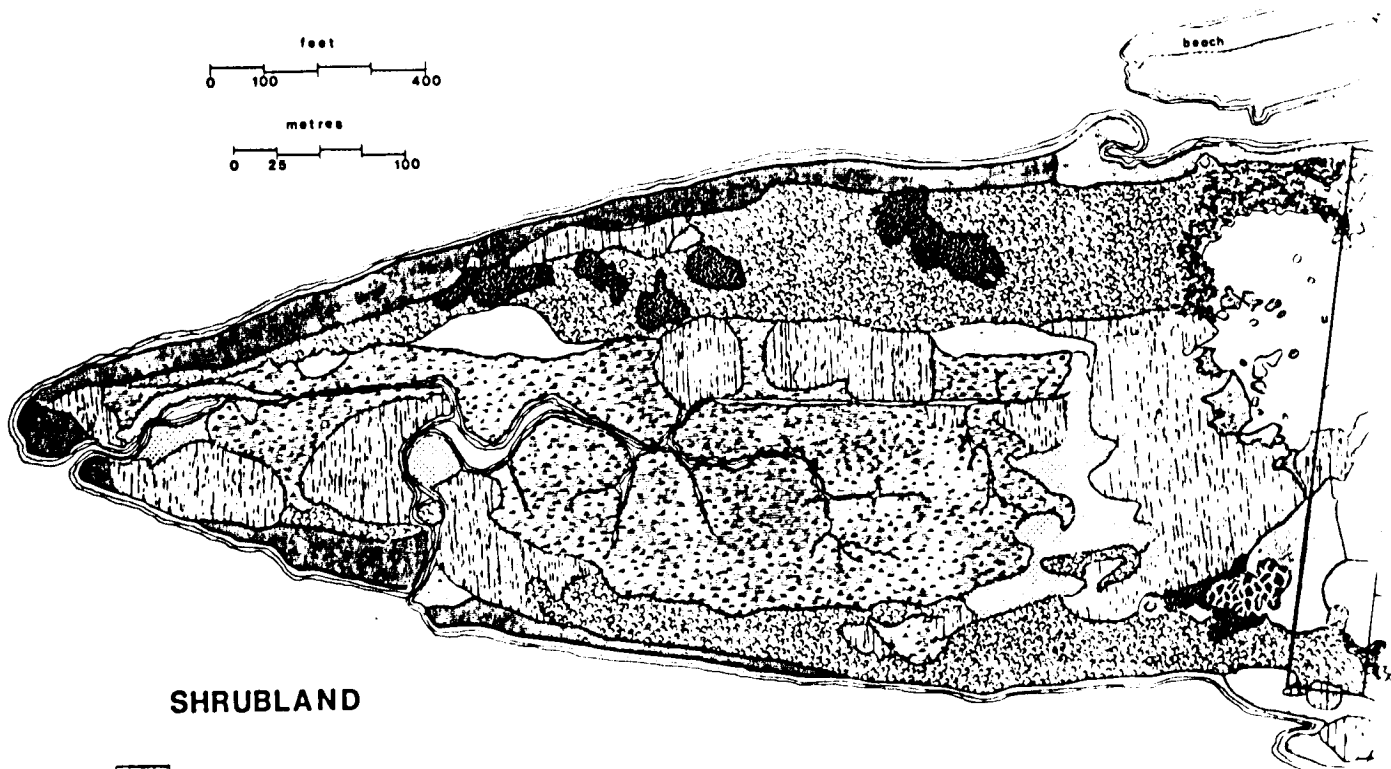
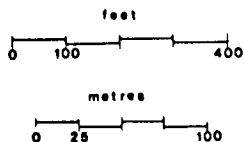
37. One Sherman live trap was set at each station and baited with dry oatmeal. All traps were checked twice daily from approximately 8:30 - 11:00 am and again from 1:00 - 3:00 pm for seven consecutive days. Grids were run sequentially from 1 June to 2 August. All traps were inspected periodically to check bait and working mechanisms.

38. For each animal caught, species, weight, sex, and reproductive condition were recorded. Each animal was marked using the toe clip system described by Davis (1956). Since this system allows a maximum of 160 animals to be marked without repeating numbers, an ear clipping system was used in addition.

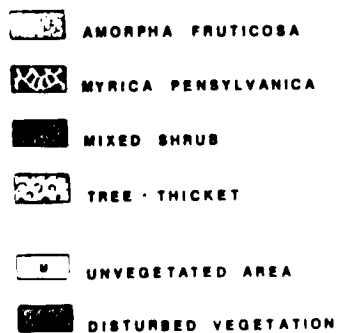
39. In order to determine mammal species distribution by habitat, the percent cover by species of all vegetation within a 1-m radius of each trap station was recorded. This information along with that from the 1976 vegetation map of Nott Island were used to classify each trap location according to the 14 major vegetation associations shown on the 1976 map. A chi-square analysis was applied to test whether each small mammal species was randomly distributed throughout all habitats (i.e.

NOTT ISLAND

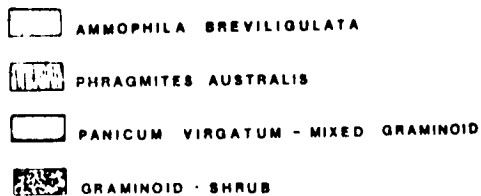
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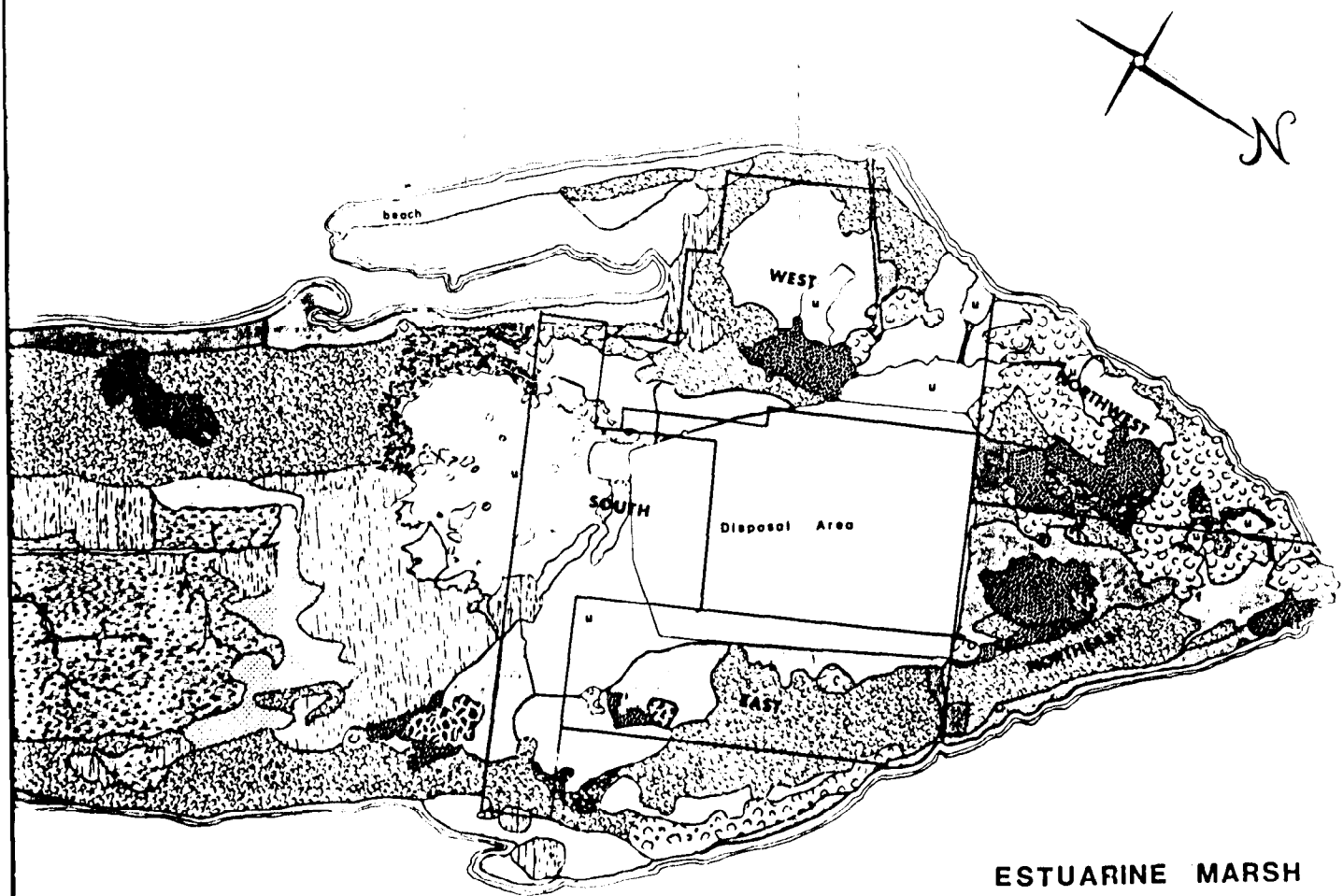


GRASSLAND







August 1978






Figure 6. Locations of small mammal sampling



GRASSLAND

ESTUARINE MARSH

-  AMMOPHILA BREVILIGULATA
-  PHRAGMITES AUSTRALIS
-  PANICUM VIRGATUM - MIXED GRAMINOID
-  GRAMINOID - SHRUB

-  PHRAGMITES AUSTRALIS
-  TYPHA ANGUSTIFOLIA
-  TYPHA ANGUSTIFOLIA - FORBS
-  GRAMINOID - FORBS
-  INTERTIDAL BORDER

Connecticut College Department of Botany

Figure 6. Locations of small mammal sampling grids

showed no habitat preference).

Results

40. Species abundance. Three small mammal species were caught: meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonius*), and short-tailed shrew (*Blarina brevicauda*)*. The actual number of captures and recaptures for each species is given in Table 6. Population sizes were estimated by the Schnabel technique (Schnabel 1938) and are given with density figures and species ratios by grids in Table 7.

41. The meadow vole was the most abundant species on all grids except the South. Their average density varied from 12.9 to 66.1 per ha with the highest population in the Northwest grid. Studies of meadow vole populations in the northeastern United States show that densities vary seasonally and fluctuate cyclically, apparently on a 4-yr cycle (Hamilton 1937 and Krebs et al. 1973). Assessment of meadow vole populations on Nott Island must, therefore, take into account their variable nature.

42. Meadow jumping mice were caught in greatest numbers on the West grid (Table 6), but the population estimate indicated that their greatest density (44.8/ha) was on the South grid (Table 7). The lowest density for this species occurred on the Northwest grid (5.1/ha). It was noteworthy that the greatest density of meadow jumping mice was in the grid containing the lowest density of meadow voles, and similarly, the lowest density of jumping mice occurred where meadow voles were most abundant. It was not known if this situation was due to interspecific interactions, differences in habitat, or to some other factor. Reports in the literature for average densities of meadow jumping mice indicate that their numbers vary seasonally and annually (Blair 1940a, Quimby 1951). The densities determined for meadow jumping mice on Nott Island were consistent with those reported in the literature.

43. Few short-tailed shrews were caught: the most, 6, were caught in the West grid and none were caught in the Northeast grid (Table 6).

* Nomenclature follows that of Jones et al. (1975).

Table 6

Summary, by Grids, of Total Number of Captures and Recaptures of Small Mammals, Nott Island, 1976

Grid	Meadow vole			Meadow jumping mouse			Short-tailed shrew			Total Captured and Recaptured
	Number Captured	Number Recaptured	Total	Number Captured	Number Recaptured	Total	Number Captured	Number Recaptured	Total	
theast	56	49	105	28	68	96	0	0	0	201
rthwest	84	68	152	8	7	15	3	0	3	170
s.	47	116	163	27	17	44	3	0	3	210
st	73	108	181	38	67	105	6	3	9	295
th	31	77	108	24	3	27	2	0	2	137
al, all grids			709			287			17	1013

see text for number of traps and dates.

Table 7
Summary, by Grids, of Population Estimates, Densities, and Percent Composition
for the Three Small Mammal Species, 1976

Grid	Area	Meadow vole		Meadow jumping mouse		Short-tailed shrew		Percent Composition by each species		
		Population Estimate	Density No./ha	Population Estimate	Density No./ha	Population Estimate	Density No./ha	Vole	Mouse	Shrew
northeast	2.16	46.6	21.6	27.6	12.8	0*	-	62.8	37.2	0
northwest	1.58	104.5	66.1	8.0	5.1	3*	-	92.9	7.1	0
east	2.02	39.2	19.4	38.6	19.1	3*	-	50.4	49.6	0
west	2.55	65.2	25.6	37.7	14.8	76.67	2.6	59.5	34.4	6.1
south	2.07	26.8	12.9	92.7	44.8	2*	-	22.4	77.6	0
mean Densities			29.1		19.3		2.6			

*Number actually caught when too few were trapped for a reliable population estimate.

There were enough recaptures to estimate the population density in the West grid at 2.6/ha. This appears to be consistent with densities reported for short-tailed shrews (Blair 1940c, Wetzel 1958).

44. Sex composition. Behavioral differences between the sexes are known to interact with age and breeding condition to influence the trappability of small mammals (Smith et al. 1975). Hence the sex composition observed on Nott Island must take into account that all trapping was done during the summer months.

45. The sex composition for the population of captured meadow voles was 62 percent male and 38 percent female, or a male:female ratio of 1.6. For comparison, other male:female ratios of meadow voles reported in the literature are 1.3 (Blair 1940b), 2.3 (Townsend 1935), 0.7 and 2.3 in an old field situation (Getz 1960), and 0.7 and 1.5 in a marsh (Getz 1960).

46. For jumping mice, the sex composition of captures on Nott Island was 56 percent male and 44 percent female, for a male:female ratio of 1.3. In comparison, Blair (1940a) reports a ratio of 1.1 and Townsend (1935) a ratio of 1.6.

47. The sex ratio for short-tailed shrews on Nott Island was 0.7 (40 percent male and 60 percent female). However, most studies in the literature report a preponderance of males for this species (Dapson 1968). The disagreement may in part be due to the relatively small numbers of shrews caught in this study and possible error in sexing the animals.

48. Habitat use. Table 8 summarizes the number of small mammal captures and recaptures as to the habitat (vegetation association) in which they occurred. The results of chi-square analyses indicated that both the meadow vole and the meadow jumping mouse were evenly distributed in the three major habitats of shrubland, grassland, and wetland (i.e., the proportion of captures in each of the three major habitats agreed with what would be expected based on the frequency of traps: for voles $\chi^2 = .75$, $df = 2$, $P < .750$; for mice $\chi^2 = 2.46$, $df = 2$, $P < .500$). In contrast, short-tailed shrews were not evenly distributed in the three major habitats and were found at a higher percentage than expected in the wetland habitat ($\chi^2 = 79.58$, $df = 2$, $P < .005$). Lack

Table 8
Summary, by Habitat of Total Captures of
Small Mammals, Mott Island, 1976

Habitat	Number of Trap Nights	Meadow vole		Meadow jumping mouse		Short-tailed shrew	
		Number Captures	Catch/ Trap Night	Number Captures	Catch/ Trap Night	Number Captures	Catch/ Trap Night
Shrublands							
<i>Amorpha fruticosa</i>	1400	194	0.14	102	0.07	3	< 0.01
Mixed shrub	392	42	0.11	16	0.04	0	0
<i>Myrica pensylvanica</i>	454	10	0.06	17	0.11	0	0
Tree - thicket	728	106	0.15	12	0.02	3	< 0.01
Subtotal	2674(40.1)	352(49.6)	0.13	147(51.2)	0.05	6(35.3)	< 0.01
Grasslands							
<i>Ammophila breviliquata</i>	1190	145	0.12	54	0.05	1	< 0.01
<i>Panicum virgatum</i> - Mixed Graminoid	924	115	0.12	69	0.07	0	0
Graminoid - Shrub	168	33	0.20	5	0.03	2	0.01
<i>Phragmites australis</i>	0	0	0	0	0	0	0
Subtotal	2282(34.2)	293(41.3)	0.13	128(44.6)	0.06	3(17.6)	< 0.01
Estuarine wetlands							
<i>Typha angustifolia</i>	0	0	0	0	0	0	0
<i>Phragmites australis</i>	168	25	0.15	5	0.03	7	0.04
<i>Typha</i> - Forb	14	2	0.14	0	0	0	0
Graminoid - Forb	0	0	0	0	0	0	0
Intertidal border	0	0	0	0	0	0	0
Subtotal	182(2.7)	27 (3.8)	0.15	5(1.7)	0.03	7(41.2)	0.04
Disturbed vegetation	140 (2.1)	25 (3.5)	0.18	5(1.7)	0.04	0	0
Disposal Site	532 (8.0)	11 (1.6)	0.02	0	0	0	0
Unvegetated Areas	854 (12.8)	1 (0.1)	<0.01	2(0.1)	<0.01	1	<0.01
Total	6664	709	0.11	287	0.04	17(5.9)	<0.01

Note: Numbers in parentheses are percentages of trap nights and of number of catches per habitat

of adequate vegetative cover led to low numbers of captures in the disposal site and in unvegetated areas. The major exception to this was meadow voles caught in the disposal site near clumps of beach grass and reedgrass.

49. The occurrence of meadow voles in all three habitat types on Nott Island is consistent with reports in the literature that it is found in a variety of situations: moist grasslands (Hall and Kelson 1959), mixed trees and grass (Buckner 1957, Stickel and Warbach 1960), and mature woodlands on islands (Dice 1925, Manville 1951, Werner 1956, and Webb 1965) and on the mainland (Soper 1946, Connor 1960).

50. Habitat use by meadow jumping mice on Nott Island is consistent with reports in the literature. Quimby (1951), Getz (1961), and Whitaker (1963) have found jumping mice in marsh, grass areas, and open upland forests. On Nott Island it was interesting to note that the greatest density of jumping mice was in the South grid in the area closest to the large marsh.

51. Short-tailed shrews indicated a preference for wetland habitat on Nott Island. According to the literature, shrews are normally found in moist situations (Pruitt 1953 and 1959) but avoid standing water (Getz 1961). The relative scarcity of shrews in Nott Island grasslands is at least partially explained by the lower moisture and higher temperatures in those areas.

Comparison with previous studies

52. Data from previous small mammal studies in 1974 and 1975 on Nott Island are given in Table 9. In the three years of study, three species (meadow voles, meadow jumping mice, and short-tailed shrews) have been continually present. The white-footed mouse (*Peromyscus leucopus*) was present in two years and the Norway rat (*Rattus norvegicus*) was trapped in one year. The white-footed mouse, which inhabits shrublands and forests and which was present in 1974 and in March 1975, may have been eliminated from the island by some aspect of the disposal operation of February to April 1975, or may have undergone natural extinction. Whether the disposal altered the white-footed mouse habitat or perhaps buried a small population is not known. The north end of the

Table 9
Comparison of Trapping Results for all Periods

Trapping Period	Number of Trap Nights	Meadow vole		Meadow jumping mouse		White-footed mouse		Short-tailed shrew		Norway rat	
		Number Captures	Catch/ Trap Nights	Number Captures	Catch/ Trap Nights	Number Captures	Catch/ Trap Nights	Number Captures	Catch/ Trap Nights	Number Captures	Catch/ Trap Nights
22 September 1974	235(2.6)	73(7.7)	0.31	14(3.7)	0.06	2(66.6)	0.09	1(5.3)	0.04	0	0
12 March 1975	52(0.6)	2(0.2)	0.04	0*	0	1(33.3)	0.02	0	0	0	0
23 April 1975	61(0.7)	4(0.4)	0.07	0*	0	0	0	1(5.3)	0.02	0	0
June - 14 August 1975	1938(21.7)	163(17.1)	0.08	78(20.6)	0.04	0	0	0	0	4(100.0)	0.02
June - 2 August 1976	6664(74.5)	709(74.6)	0.11	287(75.7)	0.04	0	0	17(89.5)	<0.01	0	0
Total or Average	8950	951	0.11	379	0.04	3	<0.01	19	<0.01	4	<0.01

Note: Numbers in parentheses are percent of trap nights and percent of number of catches per period.

* Meadow jumping mice would be expected to be hibernating during this period and none were caught.

island would still appear to be suitable habitat for this species, yet none were trapped. The possible significance of any interspecific interactions that were related to the disappearance of white-footed mice is unknown.

53. Norway rats were present in the summer of 1975, but were apparently absent in 1974 and 1976. Rats probably invaded the island on boats, pipes, and other equipment associated with the disposal operations. In 1975, they were trapped mainly along the southern shores. Their ability to scavenge washed up material may have permitted their survival that summer. However, the absence of suitable food and shelter during the winter of 1975-76 may have eliminated them.

Observations of Other Mammals

54. Direct observation on conclusive signs of other mammal species not already mentioned in this report indicate that at least three other species inhabit Nott Island: white-tailed deer (*Odocoileus virginianus*), muskrat (*Ondatra zibethicus*), and eastern mole (*Scalopus aquaticus*). Apparently about three deer reside on Nott Island during the summer and move back and forth between the island and the eastern shore during the winter. Ground reconnaissance and aerial photographs reveal several muskrat houses throughout the marsh, mainly in the cattail areas. Numerous underground runways, evidenced by raised areas in the sand, were seen near the south end of the disposal site and are believed to have been made by moles.

Birds

Methodology

55. From late February through June 1976, a record of birds visiting and breeding on Nott Island was made. Observations were made on foot and by canoe and primarily during morning hours. Visiting birds included those seen in flight over the island and in the cove and river areas adjacent to the island. During the breeding period, males singing

in the same locale over a period of time were presumed to indicate a breeding pair. This information was confirmed by further observation and location of active nests.

56. To relate bird breeding to general habitat, birds were recorded as being in the upland area (any shrubland or grassland association) or in the central wetland area (the *Typha angustifolia*, *Phragmites australis*, and *Typha*-Forb associations). Densities of breeding pairs within upland and the central wetland areas were calculated.

Results

57. A total of 51 species was observed in 1976; this includes 33 species of visitors (Table 10) and 18 species of breeding pairs (Table 11). In 1975, the species count totalled 60 of which 23 were breeding. For both years combined, 70 species were recorded of which 26 were breeding.

58. Common visitors during 1976 included black duck (*Anas rubripes*), semipalmated sandpiper (*Calidris pusillus*), snowy egret (*Egretta thula*), little blue heron (*Florida caerulea*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), osprey (*Pandion haliaetus*), and double-crested cormorant (*Phalacrocorax auritus*) (Table 10). The most commonly seen species, the herring gull, was particularly abundant on the sandspit on the west side of the island.

59. Of the 29 species of birds that nested on Nott Island in 1975 and 1976, 15 species nested both years (Table 11). Of these, only the song sparrow (*Melospiza melodia*) nested in both upland and marsh areas in both years. The red-winged blackbird (*Agelaius phoeniceus*) nested in the marsh both years but in the upland only in 1976. Two species nested only in the marsh area but in both years: the long-billed marsh wren (*Cistothorus palustris*) and swamp sparrow (*Melospiza georgiana*). By comparison, eight species had nests in upland areas both years: common flicker (*Colaptes auratus*), bobwhite (*Colinus virginianus*), yellow warbler (*Dendroica petechia*), gray catbird (*Dumetella carolinensis*), willow flycatcher (*Empidonax traillii*), American goldfinch (*Carduelis tristis*), starling (*Sturnus vulgaris*), and mourning dove (*Zenaidura macroura*).

Table 10

Bird Species Observed Visiting Nott Island,
February - June 1976

Scientific Name	Common Name	Remarks
<i>Anas rubripes</i>	Black duck	Common
<i>Butorides striatus</i>	Green heron	Uncommon
<i>Calidris pusillus</i>	Semipalmated sandpiper	Common
<i>Cathartes aura</i>	Turkey vulture	Occasional
<i>Carpodacus purpureus</i>	Purple finch	Rare
<i>Charadrius semipalmatus</i>	Semipalmated plover	Uncommon
<i>Circus cyaneus</i>	Marsh hawk	Occasional
<i>Cygnus olor</i>	Mute swan	Occasional
<i>Egretta thula</i>	Snowy egret	Common
<i>Erolia minutilla</i>	Least sandpiper	Uncommon
<i>Falco sparverius</i>	American kestrel	Seen once
<i>Florida caerulea</i>	Little blue heron	Fairly common
<i>Gavia immer</i>	Common loon	Seen once
<i>Hirundo rustica</i>	Barn swallow	Occasional
<i>Iridoprocne bicolor</i>	Tree swallow	Occasional
<i>Ixobrychus exilis</i>	Least bittern	Seen once in marsh
<i>Larus argentatus</i>	Herring gull	Abundant
<i>Larus marinus</i>	Great black-backed gull	Common to abundant
<i>Megaceryle alcyon</i>	Belted kingfisher	Rare
<i>Mergus merganser</i>	Common merganser	Occasional
<i>Nycticorax nycticorax</i>	Black-crowned night heron	Occasional immatures in marsh
<i>Pandion haliaetus</i>	Osprey	Common
<i>Phalacrocorax auritus</i>	Double-crested cormorant	Common
<i>Phasianus colchicus</i>	Ring-necked pheasant	Rare

(Continued)

Table 10 (Concluded)

Scientific Name	Common Name	Remarks
<i>Pluvialis squatarola</i>	Black-bellied plover	Rare
<i>Quiscalus quiscula</i>	Common grackle	Occasional
<i>Riparia riparia</i>	Bank swallow	Rare
<i>Seiurus noveboracensis</i>	Northern waterthrush	Seen once
<i>Sterna albifrons</i>	Least tern	Uncommon
<i>Sterna hirundo</i>	Common tern	Uncommon
<i>Tringa flavipes</i>	Lesser yellowlegs	Rare
<i>Tringa melanoleucus</i>	Greater yellowlegs	Uncommon
<i>Tyrannus tyrannus</i>	Eastern kingbird	Two seen

Table 1.
Number of Breeding Bird Pairs and Densities in Central Marsh and Upland Areas on Mott Island, 1975 and 1976
(Central Marsh = 9.6 ha, Upland Areas = 20.0 ha)

Scientific and Common Name	Central Marsh Area				Upland Areas				Total (Central Marsh and Upland Areas)			
	1975		1976		1975		1976		1975		1976	
	Number of Breeding Pairs	Density/ha	Number of Breeding Pairs	Density/ha	Number of Breeding Pairs	Density/ha	Number of Breeding Pairs	Density/ha	Number of Breeding Pairs	Density/ha	Number of Breeding Pairs	Density/ha
<i>Actitis macularia</i> Spotted sandpiper	Not observed	--	Not observed	--	3	0.15	Not observed	--	3	0.11	Not observed	--
<i>Melospiza phoeniceus</i> Red-winged blackbird	25	2.64	23	2.71	Not observed	--	8	0.40	25	0.88	31	1.09
<i>Anas platyrhynchos</i> Mallard	2	0.24	Not observed	--	Not observed	--	3	0.15	2	0.07	3	0.11
<i>Branta canadensis</i> Canada goose	3	0.35	Not observed	--	Not observed	--	Not observed	--	3	0.11	Not observed	--
<i>Cardinalis cardinalis</i> Cardinal	Not observed	--	Not observed	--	2	0.10	Not observed	--	2	0.07	Not observed	--
<i>Chondestes tristis</i> American goldfinch	Not observed	--	Not observed	--	5	0.25	1	0.05	5	0.18	1	0.04
<i>Chondestes mexicanus</i> House finch	Not observed	--	Not observed	--	3	0.15	2	0.10	3	0.11	2	0.07
<i>Charadrius vociferus</i> Killdeer	Not observed	--	Not observed	--	Not observed	--	2	0.10	Not observed	--	2	0.07
<i>Helminthophila palustris</i> Long-billed marsh wren	15	1.76	16	1.88	Not observed	--	Not observed	--	15	0.53	16	0.56
<i>Colaptes auratus</i> Common flicker	Not observed	--	Not observed	--	2	0.10	1	0.05	2	0.07	1	0.04
<i>Cinclus virginianus</i> Robwhite	Not observed	--	Not observed	--	6	0.30	3	0.15	6	0.21	3	0.11
<i>Corvus brachyrhynchos</i> Common crow	Not observed	--	Not observed	--	Not observed	--	1	0.05	Not observed	--	1	0.04
<i>Cyanocitta cristata</i> Blue jay	Not observed	--	Not observed	--	1	0.05	Not observed	--	1	0.04	Not observed	--
<i>Empidonax petechia</i> Yellow warbler	Not observed	--	Not observed	--	17	0.85	15	0.75	17	0.60	15	0.53
<i>Metopias carolinensis</i> Gray catbird	Not observed	--	Not observed	--	10	0.50	3	0.15	10	0.35	3	0.11
<i>Empidonax traillii</i> Willow flycatcher	Not observed	--	Not observed	--	5	0.25	3	0.15	5	0.18	3	0.11
<i>Geothlypis trichas</i> Common yellow-throat	2	0.24	Not observed	--	12	0.60	11	0.55	14	0.47	11	0.40
<i>Spizella georgiana</i> Champ sparrow	1	0.12	3	--	Not observed	--	Not observed	--	1	0.04	3	0.11
<i>Spizella melodia</i> Song sparrow	6	0.71	2	--	14	0.65	19	0.95	19	0.67	21	0.74
<i>Empidonax polyglottos</i> Mockingbird	Not observed	--	Not observed	--	2	0.10	Not observed	--	2	0.07	Not observed	--

(Continued)

Table 11 (Concluded)

Scientific and Common Name	Central Marsh Area				Upland Area				Total (Central Marsh and Upland Areas)			
	1975		1976		1975		1976		1975		1976	
	Number of Breeding Pairs	Density/ ha	Number of Breeding Pairs	Density/ ha	Number of Breeding Pairs	Density/ ha	Number of Breeding Pairs	Density/ ha	Number of Breeding Pairs	Density/ ha	Number of Breeding Pairs	Density/ ha
<i>Parus stricapillus</i> Black-capped chickadee	not observed	--	not observed	--	1	0.05	not observed	--	1	0.04	not observed	--
<i>Philohela minor</i> American woodcock	not observed	--	not observed	--	not observed	--	1	0.05	not observed	--	1	0.04
<i>Fallus limicola</i> Virginia rail	1	0.12	not observed	--	not observed	--	not observed	--	1	0.04	not observed	--
<i>Sturnus vulgaris</i> Starling	not observed	--	not observed	--	3	0.15	2	0.10	3	0.11	2	0.07
<i>Tyrannus tyrannus</i> Eastern kingbird	not observed	--	not observed	--	2	0.10	not observed	--	2	0.07	not observed	--
<i>Zenaidura macroura</i> Mourning dove	not observed	--	not observed	--	3	0.15	2	0.10	4	0.11	2	0.07
TOTAL	55	6.47	44	5.18	90	4.50	77	3.85	145	5.09	121	4.25

60. Eight species nested in 1975 but not in 1976: Canada goose (*Branta canadensis*), Virginia rail (*Rallus limicola*), spotted sandpiper (*Actitis macularia*), blue jay (*Cyanocitta cristata*), mockingbird (*Mimus polyglottus*), black-capped chickadee (*Parus atricapillus*), cardinal (*Cardinalis cardinalis*), and eastern kingbird (*Tyannus tyrannus*).

61. Three species of breeding birds were observed in 1976 but not in 1975: killdeer (*Charadrius vociferus*), American woodcock (*Philohela minor*), and common crow (*Corvus brachyrhynchos*).

62. The number of breeding pairs, as well as the number of breeding species, declined from 1975 to 1976. In 1975, 145 pairs were observed, and in 1976 there were 121 pairs (Table 11). In both years, nearly twice as many pairs nested in upland areas as compared to the number in the central marsh. However, the density of pairs was greater in the central marsh (6.47 and 5.18) than in the upland (4.50 and 3.85) (Table 11).

63. There was no breeding activity on either the new or the old disposal areas. Bird activity there was mostly roosting and some feeding by gulls, crows, and swallows. The areas of greatest diversity of breeding birds were also those with the greatest vegetational diversity and maximum cover. While greatest densities of breeding pairs occurred in marsh areas, only the swamp sparrow showed a preference for reedgrass.

Microclimates

Method

64. Five temperature stations were established on 30 June 1976 and read at least twice weekly until they were removed on 19 August 1976. The locations of the stations are given on Figure 3. One was located in wetland, three in the shrublands, and one in the grasslands (Figure 7). Each station consisted of a pair of minimum-maximum thermometers, one at ground level and one 30 cm above the soil surface. Both thermometers were supported on a single stake, shaded on three sides and above, with the open side facing north.

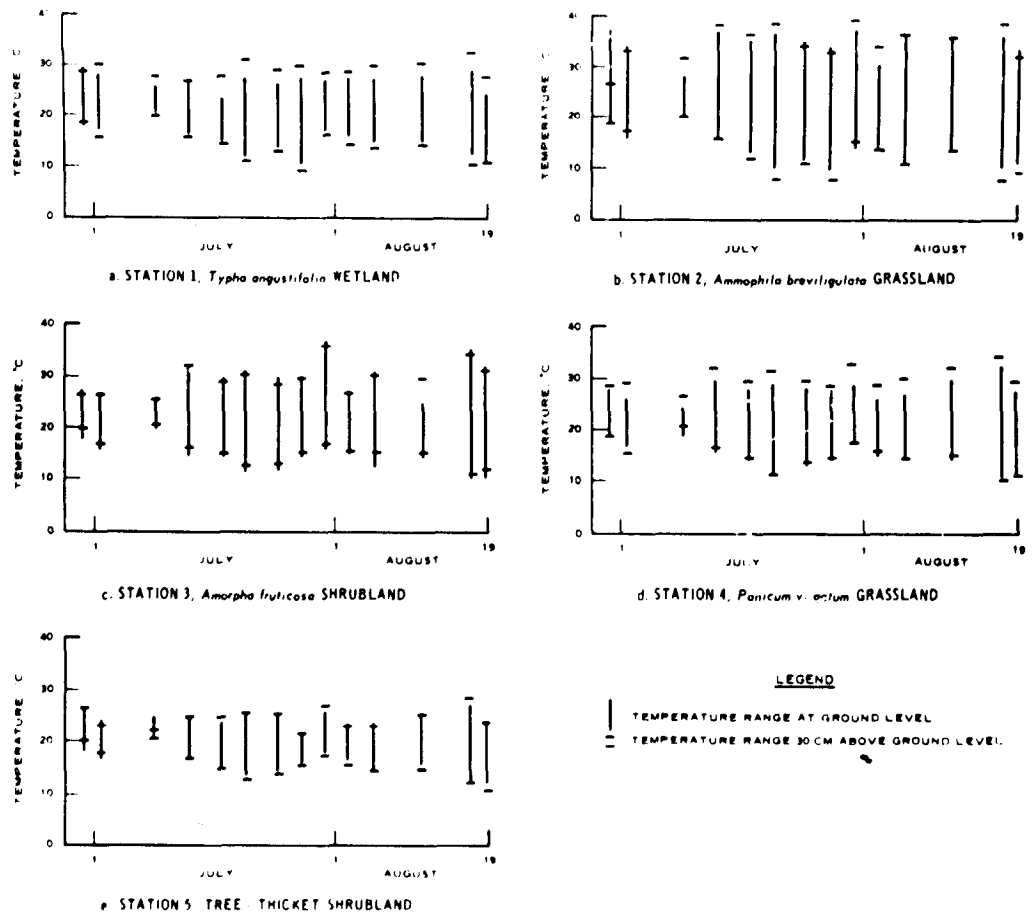


Figure 7. Temperature ranges at microclimate stations

with the open side facing north.

Results

65. Graphs of temperature ranges for each station during the study period are given in Figure 7. The station showing the greatest temperature extremes was Number 2 in the *Ammophila breviligulata* grassland. There, both minimum and maximum values for surface and 30-cm readings had the largest minimum - maximum ranges throughout the sampling period; the temperature at the 30-cm height consistently tended to be 5 to 18 degrees greater than at ground level.

66. The most temperature-stable station was Number 5 in the Tree-Thicket shrubland. Maximum temperature were 10 to 35 degrees lower than in the *Ammophila breviligulata* (Station 2) grassland and minimums were 10 to 25 degrees higher. There was also much less difference between the surface and 30-cm readings. All these differences were predictable from microclimate literature. The *Amorpha fruticosa* shrubland (Station 3) showed a range of temperatures at both ground level and 30-cm that was second only to the *Ammophila breviligulata* (Station 2) grassland. Because of the rather dense shrub canopy at Station 3, the results were not quite as expected. Temperature extremes at the *Typha angustifolia* (Station 1) wetland and at the *Panicum virgatum* - mixed graminoid (Station 4) grassland were approximately the same, with the wetland station slightly cooler.

PART III: ESTABLISHMENT OF EXPERIMENTAL PLOTS

Experimental Design

67. An area in the southwest corner of the disposal site was selected for establishment of the experimental plots. This area had a relatively uniform layer of fine organic material (from the recreational channel) over sandy dredged material (from the main channel). The depths of the finer-textured deposits appeared to increase somewhat on both north-to-south and east-to-west gradients. The area was thoroughly rototilled by the Wildlife Division of the Connecticut Department of Environmental Protection (DEP) during mid-August 1976, and planted in the third week.

68. Three replicates of 32 plots, for a total of 96, were laid out (Figure 8). Each plot measured 1.5 by 1.0 m and 0.5-m spacing was left between contiguous plots. Four species of grasses, tall fescue (*Festuca elatior*), orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*), and perennial ryegrass (*Lolium perenne*); and two legumes, red clover, (*Trifolium pratense*), and white clover (*Trifolium repens*) were planted. Two rows were left unplanted. Four different lime treatments were applied to each species: control, and 3.6, 5.4, and 7.2 metric tons per 0.4 ha.

Initial Observations

69. The site was visited on 1 October 1976, and estimates were made of percent vegetation cover and plant height within each plot. Notes on plant appearance and other observations were made. Cover and height estimates are given in Table 12. Even after this short growing period, the estimates for these species clearly showed the positive effects of lime but did not indicate any clear trend in terms of optimum levels. Overall, plant growth was least vigorous in the Replicate 3, the southernmost replicate where the finer-textured deposits were the deepest.

NORTH	Not planted	1	0	3	2	3	2	1	0	0	3	2	1
	<i>Trifolium repens</i> White clover	2	3	0	1	1	3	2	0	2	0	1	3
	<i>Trifolium pratense</i> Red clover	1	2	3	0	1	0	2	3	2	0	1	3
	Not planted	1	2	0	3	2	0	3	1	2	1	3	0
	<i>Lolium perenne</i> Perennial ryegrass	1	2	3	0	2	3	0	1	1	2	0	3
	<i>Phleum pratense</i> Timothy	2	3	0	1	3	2	0	1	0	1	3	2
	<i>Dactylis glomerata</i> Orchard grass	3	1	0	2	2	0	1	3	2	1	0	3
	<i>Festuca elatior</i> Tall fescue	0	2	1	3	3	1	2	0	2	3	0	1
		Replicate 1				Replicate 2				Replicate 3			

Figure 8. Planting plan for the experimental plots established within the disposal area. Each plot is 1.5 x 1.0 m with 0.5 m between contiguous plots. Lime treatments are indicated by numbers within each plot as follows: 0, no lime; 1, 3.6 metric tons/0.4 ha; 2, 5.4 metric tons/0.5 ha; and 3, 7.2 metric tons/0.4 ha

Table 12
Seedling Development in the Experimental Plots about Four
Weeks after Planting*

Species	Replicate No.	Estimate of Growth within Lime Treatment**							
		Percent Cover				Height, cm			
		Line 0	Line 1	Line 2	Line 3	Line 0	Line 1	Line 2	Line 3
<i>Trifolium repens</i> White clover	1	2	25	25	35	1.5	3.0	7.5	5.0
	2	2	15	28	30	1.5	3.5	6.0	4.5
	3	12	13	10	12	2.5	2.0	3.0	2.0
	Mean	5.3	17.7	21	25.7	1.8	2.8	5.5	3.8
<i>Trifolium pratense</i> Red clover	1	3	10	12	20	3.0	5.0	7.5	7.0
	2	5	15	35	22	3.5	3.5	8.0	9.0
	3	3	15	15	11	1.0	4.5	4.5	3.5
	Mean	3.7	13.3	20.7	17.7	2.5	4.3	6.7	6.5
<i>Lolium perenne</i> Perennial ryegrass	1	25	28	45	45	14.0	12.0	20.0	16.0
	2	12	45	33	35	10.0	18.0	15.0	18.0
	3	5	50	35	45	7.0	23.0	17.0	16.0
	Mean	4.0	41.0	37.6	41.7	10.3	17.7	17.3	16.7
<i>Phleum pratense</i> Timothy	1	2	8	20	25	5.0	8.0	7.0	10.0
	2	2	20	35	45	5.0	9.0	11.0	12.0
	3	1	7	10	30	5.0	7.0	7.0	8.0
	Mean	1.7	11.7	21.7	33.3	5.0	8.0	8.3	10.0
<i>Daactylis glomerata</i> Orchard grass	1	5	23	55	18	8.0	13.0	25.0	13.0
	2	5	42	45	28	13.0	18.0	22.0	17.0
	3	3	40	33	20	8.0	17.0	18.0	15.0
	Mean	4.3	35.0	44.3	22.0	9.7	16.0	21.7	15.0
<i>Festuca elatior</i> Tall fescue	1	8	35	35	30	8.0	13.0	15.0	18.0
	2	15	55	32	35	14.0	20.0	20.0	18.0
	3	3	35	60	35	6.0	20.0	18.0	18.0
	Mean	8.7	41.7	42.3	33.3	9.3	17.7	17.7	18.0

*Seeds were planted third week of August 1976. Estimates on this table were made 1 October 1976.

** Line 0 = No lime

Line 1 = 3.6 metric tons/0.4 ha

Line 2 = 5.4 metric tons/0.4 ha

Line 3 = 7.2 metric tons/0.4 ha

70. Deer and geese were common on the site in October, as witnessed by tracks and droppings, and may have grazed the plantings. The clovers and orchard grass in particular appeared to have been grazed.

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APPENDIX A': NOTT ISLAND FLORA BY FAMILIES*

Family	Scientific Name	Common Name
<i>Equisetaceae</i> Horsetail family	<i>Equisetum arvense</i>	Horsetail
<i>Polypodiaceae</i> Fern Family	<i>Dryopteris Thelypteris</i> <i>Onoclea sensibilis</i>	Marsh fern Sensitive fern
<i>Taxaceae</i> Yew family	<i>Taxus cuspidata</i>	Japanese yew
<i>Pinaceae</i> Pine family	<i>Juniperus virginiana</i> <i>Pinus sp.</i>	Red cedar Pine
<i>Typhaceae</i>	<i>Typha angustifolia</i>	Narrow-leaved cattail
<i>Sparganiaceae</i> Bur-reed family	<i>Sparganium eurycarpum</i>	Bur-reed
<i>Zosteraceae</i> Pondweed family	<i>Potamogeton sp.</i>	Pondweed
<i>Alismataceae</i> Water-plantain family	<i>Alisma subcordatum</i> <i>Lophotocarpus spongiosus</i>	Water-plantain Hooded arrowhead
<i>Gramineae</i> Grass family	<i>Agropyron repens</i> <i>Agrostis alba</i> <i>Agrostis hyemalis</i> <i>Agrostis scabra</i> <i>Agrostis tenuis</i> <i>Ammophila breviligulata</i> <i>Anthoxanthum odoratum</i> <i>Cenchrus tribuloides</i> <i>Digitaria sanguinalis</i> <i>Echinochloa crusgalli</i> <i>Echinochloa pungens</i> ** <i>Echinochloa Walteri</i> ** <i>Elymus virginicus</i> <i>Eragrostis megastachya</i> ** <i>Eragrostis pilosa</i> ** <i>Festuca octoflora</i> <i>Festuca ovina</i> <i>Festuca rubra</i> <i>Leersia oryzoides</i> <i>Leptoloma cognatum</i> <i>Panicum capillare</i>	Witch-grass Red top Ticklegrass Hairgrass Rhode Island bent Beachgrass Sweet vernal grass Sand-spur Crab-grass Barnyard-grass Wild rye Stink-grass Love-grass Sheep's-fescue Fescue Rice cutgrass Fall witch-grass Old-witch grass

*Nomenclature based primarily on Gray's Manual of Botany, 8th edition (Fernald 1950).

**Tentative identification for these species and for the genera *Agrostis*, *Poa*, *Carex*, *Cyperus*, and *Juncus* except *Juncus effusus*.

Family	Scientific Name	Common Name
Gramineae (Continued)	<i>Panicum clandestinum</i>	Panic grass
	<i>Panicum dichotomiflorum</i>	Panic grass
	<i>Panicum latifolium</i> **	Panic grass
	<i>Panicum lanuginosum</i> **	Panic grass
	<i>Panicum meridionale</i> **	Panic grass
	<i>Panicum philadelphicum</i> **	Panic grass
	<i>Panicum virgatum</i>	Switchgrass
	<i>Phragmites australis</i>	Reedgrass
	<i>Poa compressa</i>	Canada bluegrass
	<i>Poa nemoralis</i>	Foin a vaches
	<i>Poa palustris</i>	Fowl-meadow grass
	<i>Poa trivialis</i>	Rough-stalked meadow-grass
	<i>Spartina alterniflora</i>	Salt-water cordgrass
	<i>Spartina cynosuroides</i>	Salt reedgrass
	<i>Spartina pectinata</i>	Fresh-water cordgrass
	<i>Triplasis purpurea</i>	Sand-grass
	<i>Zizania aquatica</i>	Wild rice
Cyperaceae	<i>Bulbostylis capillaris</i>	Sedge
Sedge family	<i>Carex annectens</i>	Sedge
	<i>Carex hormathodes</i>	Sedge
	<i>Carex lanuginosa</i>	Sedge
	<i>Carex lurida</i>	Sedge
	<i>Carex retrorsa</i>	Sedge
	<i>Carex rostrata</i>	Sedge
	<i>Carex scabrata</i>	Sedge
	<i>Carex stipata</i>	Sedge
	<i>Carex vulpinoidea</i>	Sedge
	<i>Cyperus dentatus</i>	Umbrella-sedge
	<i>Cyperus erythrorhizos</i>	Sedge
	<i>Cyperus esculentus</i>	Yellow nut-grass
	<i>Cyperus filiculmis</i>	Sedge
	<i>Cyperus odoratus</i>	Sedge
	<i>Cyperus strigosus</i>	Sedge
	<i>Eleocharis</i> spp.	Spike rush
	<i>Scirpus americanus</i>	Three-square
	<i>Scirpus atrovirens</i>	Bulrush
	<i>Scirpus cyperinus</i>	Wool grass
	<i>Scirpus fluviatilis</i>	River-bulrush
	<i>Scirpus robustus</i>	Bulrush
	<i>Scirpus validus</i>	Great bulrush
Araceae	<i>Arisaema Dracontium</i>	Green dragon
Arum family	<i>Peltandra virginica</i>	Arrow arum
Commelinaceae	<i>Commelina communis</i>	Dayflower
Spiderwort family		

Family	Scientific name	Common Name
<i>Pontederiaceae</i> Pickerelweed family	<i>Pontederia cordata</i>	Pickerelweed
<i>Juncaceae</i> Rush family	<i>Juncus acuminatus</i>	Rush
	<i>Juncus dichotomous</i>	Rush
	<i>Juncus Dudleyi</i>	Rush
	<i>Juncus effusus</i>	Soft rush
	<i>Juncus secundus</i>	Rush
	<i>Juncus tenuis</i>	Rush
<i>Liliaceae</i> Lily family	<i>Allium sp.</i>	Wild onion
	<i>Asparagus officinalis</i>	Garden asparagus
	<i>Lilium canadense</i>	Wild yellow lily
	<i>Smilax glauca</i>	Sawbrier
	<i>Smilax herbacea</i>	Carrion flower
<i>Iridaceae</i> Iris family	<i>Iris Pseudacorus</i>	Yellow iris
	<i>Iris versicolor</i>	Blue flag
	<i>Sisyrinchium angustifolium</i>	Blue-eyed grass
<i>Salicaceae</i> Willow family	<i>Populus deltoides</i>	Cottonwood
	<i>Populus tremuloides</i>	Quaking aspen
	<i>Salix fragilis</i>	Crack willow
	<i>Salix nigra</i>	Black willow
<i>Myricaceae</i> Wax-myrtle family	<i>Myrica pensylvanica</i>	Bayberry
<i>Corylaceae</i> Hazel family	<i>Alnus serrulata</i>	Common alder
	<i>Betula populifolia</i>	White birch
<i>Fagaceae</i> Beech family	<i>Quercus bicolor</i>	Swamp white oak
	<i>Quercus velutina</i>	Black oak
<i>Ulmaceae</i> Elm family	<i>Celtis occidentalis</i>	Hackberry
	<i>Ulmus americana</i>	American elm
<i>Urticaceae</i> Nettle family	<i>Boehmeria cylindrica</i>	Bog-hemp
	<i>Parietaria pensylvanica</i>	Pellitory
	<i>Pilea pumila</i>	Clearweed
	<i>Urtica dioica</i>	Stinging nettle
<i>Polygonaceae</i> Buckwheat family	<i>Polygonum arifolium</i>	Halberd-leaved tearthumb
	<i>Polygonum cuspidatum</i>	Japanese knotweed
	<i>Polygonum lapathifolium</i>	Smartweed
	<i>Polygonum punctatum</i>	Water smartweed
	<i>Polygonum sagittatum</i>	Arrow-leaved thumbweed
	<i>Polygonum scandens</i>	Climbing false buckwheat
	<i>Rumex Acetosella</i>	Sheep sorrel
	<i>Rumex orbiculatus</i>	Water dock

Family	Scientific Name	Common Name
<i>Chenopodiaceae</i> Goosefoot family	<i>Chenopodium ambrosioides</i> <i>Chenopodium</i> sp.	Mexican-tea Pigweed
<i>Amaranthaceae</i> Amaranth family	<i>Achillea cannabina</i>	Water-hemp
<i>Phytolaccaceae</i> Pokeweed family	<i>Phytolacca americana</i>	Poke
<i>Aizoaceae</i> fleshy, succulent plants	<i>Mollugo verticillata</i>	Carpetweed
<i>Caryophyllaceae</i> Pink family	<i>Arenaria lateriflora</i> <i>Saponaria officinalis</i> <i>Stellaria media</i>	Grove sandwort Soapwort Common chickweed
<i>Ranunculaceae</i> Crowfoot family	<i>Ranunculus acris</i> <i>Thalictrum polygamum</i>	Common buttercup Tall meadow-rue
<i>Berberidaceae</i> Barberry family	<i>Berberis Thunbergii</i> <i>Berberis vulgaris</i>	Japanese barberry Common barberry
<i>Lauraceae</i> Laurel family	<i>Sassafras albidum</i>	White sassafras
<i>Cruciferae</i> Mustard family	<i>Barbarea vulgaris</i> <i>Cakile edentula</i> <i>Cardamine</i> sp. <i>Lepidium virginicum</i> <i>Raphanus Raphanistrum</i> <i>Rorippa islandica</i> <i>Rorippa sylvestris</i>	Common wintercress Sea-rocket Bitter cress Poor man's pepper Wild radish Yellow cress Creeping yellow cress
<i>Saxifragaceae</i> Saxifrage family	<i>Penthorum sedoides</i>	Ditch-stonecrop
<i>Platanaceae</i> Plane-tree family	<i>Platanus occidentalis</i>	Sycamore
<i>Rosaceae</i> Rose family	<i>Crataegus</i> sp. <i>Geum laciniatum</i> <i>Potentilla anserina</i> <i>Potentilla canadensis</i> <i>Potentilla norvegica</i> <i>Prunus serotina</i> <i>Pyrus malus</i> <i>Rosa multiflora</i> <i>Rosa allegheniensis</i>	Hawthorn Avens Silverweed Cinequefoil Rough cinquefoil Wild black cherry Apple Multiflora rose Blackberry

Family	Scientific Name	Common Name
<i>Rosaceae</i> (Continued)	<i>Rubus flagellaris</i>	Dewberry
	<i>Spiraea latifolia</i>	Meadow-sweet
	<i>Spiraea tomentosa</i>	Hardhack
<i>Leguminosae</i>	<i>Amorpha fruticosa</i>	False indigo
Pulse family	<i>Desmodium</i> sp.	Tick-trefoil
	<i>Lespedeza</i> sp.	Bush-clover
	<i>Robinia Pseudo-Acacia</i>	Black locust
	<i>Strophostyles helvola</i>	Wild bean
	<i>Wisteria sinensis</i>	Chinese wisteria
<i>Linaceae</i>	<i>Linum</i> sp.	Flax
Flax family		
<i>Oxalidaceae</i>	<i>Oxalis europaea</i>	Wood-sorrel
Wood-sorrel family		
<i>Geraniaceae</i>	<i>Geranium maculatum</i>	Wild geranium
Geranium family		
<i>Simaroubaceae</i>	<i>Ailanthus altissima</i>	Tree-of-heaven
Quassia family		
<i>Euphorbiaceae</i>	<i>Euphorbia Cyparissias</i>	Cypress spurge
Spurge family	<i>Euphorbia polygonifolia</i>	Spurge
<i>Anacardiaceae</i>	<i>Rhus copallina</i>	Shining or Winged sumac
Cashew family	<i>Rhus glabra</i>	Smooth sumac
	<i>Rhus radicans</i>	Poison ivy
	<i>Rhus typhina</i>	Staghorn sumac
<i>Aquifoliaceae</i>	<i>Ilex verticillata</i>	Winterberry
Holly family		
<i>Celastraceae</i>	<i>Celastrus orbiculatus</i>	Oriental bittersweet
Staff-tree family	<i>Euonymus europaeus</i>	European spindle-tree
<i>Aceraceae</i>	<i>Acer saccharinum</i>	Silver maple
Maple family		
<i>Balsaminaceae</i>	<i>Impatiens capensis</i>	Touch-me-not
Touch-me-not family		
<i>Rhamnaceae</i>	<i>Rhamnus cathartica</i>	Common buckthorn
Buckthorn family		
<i>Vitaceae</i>	<i>Parthenocissus quinquefolia</i>	Virginia creeper
Vine family		

Family	Scientific Name	Common Name
<i>Vitaceae</i> (continued)	<i>Vitis Labrusca</i>	Fox grape
	<i>Vitis sp.</i>	Grape
<i>Malvaceae</i> Mallow family	<i>Hibiscus palustris</i>	Marsh mallow
<i>Guttiferae</i> St. John's wort family	<i>Hypericum gentianoides</i>	Orange-grass
	<i>Hypericum mutilum</i>	St. John's-wort
	<i>Hypericum punctatum</i>	St. John's-wort
<i>Lythraceae</i> Loosestrife family	<i>Lythrum Salicaria</i>	Spiked loosestrife
<i>Nyssaceae</i> Sour gum family	<i>Nyssa sylvatica</i>	Black gum
<i>Onagraceae</i> Evening primrose family	<i>Circaea quadrisulcata</i>	Enchanter's nightshade
	<i>Epilobium hirsutum</i>	Willow-herb
	<i>Oenothera parvifolia</i>	Evening primrose
<i>Umbelliferae</i> Parsley family	<i>Cicuta bulbifera</i>	Water-hemlock
	<i>Heracleum maximum</i>	Cow-parsnip
	<i>Ptilimnium capillaceum</i>	Mock bishop's weed
	<i>Sium suave</i>	Water parsnip
<i>Cornaceae</i> Dogwood family	<i>Cornus Amomum</i>	Silky dogwood
<i>Ericaceae</i> Heath family	<i>Vaccinium corymbosum</i>	Highbush blueberry
<i>Primulaceae</i> Primrose family	<i>Lysimachia ciliata</i>	Loosestrife
	<i>Samolus parviflorus</i>	Water pimpernel
<i>Oleaceae</i> Olive family	<i>Fraxinus pensylvanica</i>	Red ash
<i>Loganiaceae</i> Logania family	<i>Ligustrum sp.</i>	Privet
<i>Apocynaceae</i> Dogbane family	<i>Apocynum cannabinum</i>	Indian hemp
<i>Asclepiadaceae</i> Milkweed family	<i>Asclepias incarnata</i>	Swamp milkweed
	<i>Asclepias syriaca</i>	Milkweed
<i>Convolvulaceae</i> Convolvulus family	<i>Convolvulus sepium</i>	Morning glory
	<i>Cuscuta sp.</i>	Dodder
<i>Boraginaceae</i> Borage family	<i>Myosotis laxa</i>	Scorpion-grass

Family	Scientific Name	Common Name
<i>Verbenaceae</i> Vervain family	<i>Verbena hastata</i>	Blue vervain
<i>Labiatae</i> Mint family	<i>Lycopus americanus</i> <i>Mentha arvensis</i> <i>Mentha</i> sp. <i>Scutellaria epilobiifolia</i> <i>Scutellaria lateriflora</i> <i>Stachys tenuifolia</i> <i>Teucrium canadense</i>	Bugleweed Mint Mint Common scullcap Mad-dog skullcap Hedge nettle Wood-sage
<i>Solanaceae</i> Nightshade family	<i>Solanum Dulcamara</i> <i>Solanum nigrum</i>	Nightshade Common nightshade
<i>Scrophulariaceae</i> Figwort family	<i>Gratiola neglecta</i> <i>Linaria canadensis</i> <i>Linaria vulgaris</i> <i>Lindernia anagallidea</i> <i>Lindernia dubia</i> <i>Mimulus ringens</i> <i>Scrophularia lanceolata</i> <i>Verbascum Thapsus</i>	Hedge-hyssop Old-field toadflax Butter-and-eggs False pimpernel False pimpernel Monkey-flower Figwort Common mullein
<i>Bignoniaceae</i> Bignonia family	<i>Catalpa speciosa</i>	Catawba tree
<i>Plantaginaceae</i> Plantain family	<i>Plantago major</i> <i>Plantago</i> sp.	Common plantain Plantain
<i>Rubiaceae</i> Madder family	<i>Cephalanthus occidentalis</i> <i>Galium Aparine</i> <i>Galium</i> sp. <i>Houstonia caerulea</i>	Buttonbush Cleavers Bedstraw Bluets
<i>Caprifoliaceae</i> Honeysuckle family	<i>Lonicera japonica</i> <i>Sambucus canadensis</i> <i>Viburnum recognitum</i>	Japanese honeysuckle Common elder Arrowood
<i>Cucurbitaceae</i> Gourd family	<i>Echinocystis lcbata</i>	Wild cucumber
<i>Campanulaceae</i> Bluebell family	<i>Campanula aparinoides</i>	Marsh bellflower
<i>Compositae</i> Composite family	<i>Achillea Millefolium</i> <i>Ambrosia artemisiifolia</i> <i>Ambrosia trifida</i>	Common yarrow Common ragweed Great ragweed

Family	Scientific Name	Common Name
<i>Compositae (Continued)</i>	<i>Baccharis halimifolia</i>	Groundsel-tree
	<i>Bidens</i> sp.	Bur-marigold
	<i>Cirsium vulgare</i>	Common thistle
	<i>Erechtites hieracifolia</i>	Fireweed
	<i>Erigeron canadensis</i>	Horse-weed
	<i>Eupatorium maculatum</i>	Joe-pye-weed
	<i>Eupatorium perfoliatum</i>	Boneset
	<i>Galinsoga ciliata</i>	Blake
	<i>Gnaphalium obtusifolium</i>	Everlasting
	<i>Gnaphalium uliginosum</i>	Low cudweed
	<i>Gnaphalium</i> sp.	
	<i>Hieracium pratense</i>	King devil
	<i>Krigia virginica</i>	Dwarf dandelion
	<i>Lactuca canadensis</i>	Lettuce
	<i>Mikania scandens</i>	Climbing hempweed
	<i>Pluchea purpurascens</i>	Stinkweed
	<i>Rudbeckia serotina</i>	Black-eyed susan
	<i>Solidago graminifolia</i>	Grass-leaved goldenrod
	<i>Solidago rugosa</i>	Rough-edged goldenrod
	<i>Solidago sempervirens</i>	Seaside goldenrod
	<i>Tanacetum vulgare</i>	Common tansy
	<i>Taraxacum officinale</i>	Dandelion
	<i>Xanthium</i> sp.	Cocklebur

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Warren, R Scott

Habitat development field investigations, Nott Island upland habitat development site, Connecticut River, Connecticut; Appendix B: Survey of terrestrial ecology and preliminary botanical monitoring / by Scott R. Warren ... [et al.], Connecticut College, New London, Conn. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1978.

60, 8 p. : ill. ; 27 cm. (Technical report - U. S. Army Engineer Waterways Experiment Station ; D-78-25, Appendix B)

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1. Biological. 2. Dredged material. 3. Dredged material disposal. 4. Field investigations. 5. Habitat development. 6. Habitats. 7. Nott Island, Conn. 8. Terrestrial habitats. 9. Vegetation establishment. 10. Waste disposal sites. I. Connecticut College. II. United States Army. Corps of Engineers. III. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Technical report ; D-78-25, Appendix B.
TA7.W34 no.D-78-25 Appendix B